Agriculture

PUBLISHED 9d MONTHLY

AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Editorial Offices: 3 Whitehall Place, S.W.1 (*Phone: TRAfalgar 7711*)

VOL. LXI No. 12 MARCH 1955

Contents

Cover Photograph

Potato planting, Betchworth, Surrey.

AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

VOL. LXI No. 12 MARCH 1955

LESS LABOUR FOR WINTER FATTENING SHEEP

E. T. DAVIES, B.Sc.

Department of Economics, University of Bristol

Investigations into the economics of winter fattening of arable sheep in Devon reveal that, on average, labour accounts for nearly 40 per cent of production costs. Mr. Davies suggests that the best and most profitable way of reducing this burden is by folding on kale.

A STUDY of the official statistics for England and Wales clearly reveals the very marked change which has occurred in both the numbers and distribution of our sheep since the turn of the century. Between 1910 and the onset of World War II, sheep numbers declined from 20 millions to a little under 18 millions. This decline was greatly accelerated during the war, and by 1948 our sheep population stood at about 11 millions, or approximately 60 per cent of the 1939 level. With regard to the distribution of sheep during this period of decline, one very interesting feature emerges. Whilst the upland and grassland flock numbers have been fairly well maintained, our arable flocks have dwindled to a mere fraction of what they were half a century ago. For instance, in the three arable counties of Norfolk, Suffolk and Oxfordshire, the combined sheep population in 1910 was 1,150,698, but by 1951 this figure had declined to 187,709—a decrease of over 80 per cent. On the other hand, the decline in the grassland areas of Devon, Hereford and Brecon was relatively insignificant—from 1,807,091 in 1910 to 1,715,031 in 1951, or approximately 5 per cent.

What, then, accounts for this state of affairs? From about the first decade of the present century, when wages first began their upward trend, the bugbear of arable sheep farming in this country has undoubtedly been the heavy cost of manual labour. In 1914 the weekly cash wage of an agricultural worker was somewhere in the region of 17*s.* 6*d.*; in 1934 it was 30*s.* 6*d.*, and by June 1940 it had increased to 48*s.* During this period, cheap and ample supplies of imported mutton and lamb were available to the British consumer, and our own farmers, faced with ever-increasing labour costs, found it progressively more difficult to compete with this strong competition from abroad. Consequently, many directed their resources towards more remunerative ventures, whilst those who continued were forced to economize severely in the use of manual labour. Some idea of how changes in labour have accompanied increasing costs may be gained from a comparison of two studies into the economics of the winter fattening of arable sheep undertaken in Devon. At the time of the first study in 1934 (1), the shepherding requirements per 100 sheep were approximately 44 hours per week at a cost of 7½*d.* per hour; during the second investigation (2), covering the two-year period

1952-54, the comparative figures averaged 12 hours per week at 2*s.* 6*d.* per hour.

It is clear, even in present times, when imported supplies are limited, prices guaranteed, and markets assured to the home producer, that the very high cost of labour will leave an adequate financial incentive only to the more efficient producer. This was brought to light during the course of the recent investigation in Devon. It was shown that the profit margin accruing to the feeder averaged 7*s.* 3*d.* per sheep, but that there was considerable fluctuation, ranging from a loss to a substantial profit per sheep. At the same time, considerable variations were apparent in the labour charges incurred in the shepherding and the growing of various forage crops and, on average, total labour charges amounted to nearly 40 per cent of the production costs. Indeed, this study does establish that a strong relationship exists between profit levels and total manual labour charges. In particular, high profits can be largely attributed to low labour expenses and, in the latter respect, economy in the use of manual labour appears to revolve around two major considerations—namely, the method of feeding and the type of forage crop fed.

Folding Saves Labour It is generally accepted that in the southern counties of England the traditional method of feeding sheep on cleaned and cut roots has been largely abandoned in favour of feeding the crops *in situ* by a system of folding or grazing. In Devon, however, a small minority of farmers still adhere rigidly to the older system. These farmers claim, and perhaps rightly so, that such a system possesses two important advantages over folding: first, there is considerably less wastage by the treading and trampling of the sheep; and secondly, the sheep invariably thrive much better where the roots are cut or "fingered" before feeding in troughs. The sheep investigation in Devon did, in fact, show that whereas one acre of a folded crop yielded, on average, 15 days keep for 100 sheep, the comparative figure for one acre of cut swedes was 19 days. In addition, this higher rate of stocking under the cutting system was simultaneously accompanied by a higher rate of liveweight gain. Where sheep were fed principally on cut swedes, the weekly gain was 1.5 lb. per head, compared with an average of 1.3 lb. for all folded crops. In view of these considerations, then, is the continuance of the older practice justified?

The data presented below show that the shepherding requirements per acre for 100 sheep were 106 hours for cut swedes and 17 hours for a folded crop. The advantages apparent both in the rate of gain and the level of output under the more intensive system seem, therefore, to be outweighed by the advantages of the folding method with its marked feature of labour economy; namely, a saving of 89 shepherding hours per acre for 100 sheep.

Method of Feeding	Shepherding Hours per 100 Sheep	
	Per Week *hours*	Per Acre *hours*
Folded crops	8	17
Cleaned and cut swedes ...	39	106

It is only fair to say, however, that under both systems the amounts of hand-fed concentrates and hay were exceptionally small, and the young sheep were almost entirely dependent on home-grown forage crops for an adequate level of nutrition. Swedes are particularly deficient in protein, so the potential advantages of the more intensive method may not have been fully

exploited on the survey farms. Nevertheless, this consideration is unlikely to detract materially from the labour-saving advantages of the folding practice.

Choosing the Best Feed As well as the direct costs of shepherding, a further important consideration lies in the manual labour costs expended on the growing of the various feed crops. Roots constitute the most important item in the diet of winter fattening sheep, so any economy which can be exercised in their growing will most certainly increase the chance of profit. In this respect, choice of crop appears to merit careful thought, since, as Table 1 shows, considerable economies in manpower are possible by growing kale in preference to some of the other forms of forage crops.

Table 1

Comparative Labour Production Costs per Acre of Forage Crops
(Excluding Harvesting Costs)

Crops	Manual Labour Costs						Post-sowing as Percentage of Total Labour
	Pre-sowing		Post-sowing		Total Labour		
	hours	£	*hours*	£	*hours*	£	
Turnips or swedes ...	26	3.7	22	3.1	48	6.8	45.6
Mixed roots* ...	23	3.3	15	2.1	38	5.4	38.9
Kale	16	2.3	5	0.7	21	3.0	23.3

* Invariably a mixture of two rows of swedes and one row of kale.

This saving stems mainly from the fact that kale, when grown for sheep, is invariably a broadcast crop with very little post-sowing demands in the way of thinning and hoeing. Furthermore, it possesses the added advantage, by virtue of its winter-hardy varieties, of providing an abundant amount of edible keep at a time when swedes normally become hard, frosted, and therefore difficult for the sheep to break unaided. This is of greater importance, perhaps, in the north, where roots do not winter well in the ground and additional labour costs have to be incurred in clamping before cutting and feeding to the sheep. Successive acreages of marrowstem and thousand-head kales will ensure a continuous supply of food until March or April, and at the same time save a lot of labour, both in the shepherding and in the production of the feed crops.

Some idea is given in Table 2 of the extent to which feeding method and choice of crop can together influence the ultimate level of direct financial return from a sheep fattening enterprise. In the absence of adequate detailed information for each particular type of folded crop, this table is based on an average stock-carrying capacity of fifteen days per 100 sheep, and a weekly liveweight increase of 1.3 lb. per sheep. In the case of cleaned and cut swedes, the corresponding standards are nineteen days and 1.5 lb. Total labour costs represent those charges involved both in shepherding and growing the forage crops.

This table clearly reveals the outstanding claims of kale as the key crop to grow for sheep feed. On the basis of an average return of £17.6, it can be seen that the labour economies achieved in both the growing and the feeding of kale will result in a substantially higher "margin" to cover all other costs incurred during the fattening period. In addition, it will be

appreciated that the higher nutritional value of kale, relative to the other folded crops, will still further enhance the margin in favour of this particular crop. To achieve a margin comparable to that obtained under a system of folded kale, higher rates of liveweight gain must be attained when sheep are folded on other crops, and a considerably higher rate where the roots are cleaned and cut. In fact, the table does show that the required weekly liveweight gain must be at least ¼ lb. more under the cutting system. However, in my opinion, it is unlikely that this increased rate can be achieved without resorting to expensive supplementary feeding, and in this instance very little direct financial gain would result.

Table 2

Comparative Liveweight Increases and Total Labour Costs per Acre over a Fattening Period of 12 Weeks

Method of Feeding	Number of Sheep per Acre	Total Live-weight Gain	Value* at 2*s.* 6*d.* per lb. D.W.	Total Labour Cost	Margin (D.W. value less labour)	Required Weekly L.W. Gain per Sheep to Attain same Margin as with Kale
		lb.	*£*	*£*	*£*	*lb.*
Folded on:						
Turnips or swedes	18	281	17.6	9.2	8.4	1.6
Mixed roots				7.8	9.8	1.5
Kale				5.4	12.2	1.3
Cleaned and cut swedes	23	414	25.9	22.0	3.9	2.0

* Assuming a killing-out rate of 50 per cent.

Planning for Economy To sum up, therefore, it is evident that even when comparison of arable sheep management is restricted to the broader issues of feeding and type of forage crop fed, important labour economies can be effected in this kind of enterprise. More labour then becomes available for alternative uses on the farm. But, even under the labour-saving system of folding, there are several avenues open to the feeder to economize further in his use of labour. For example, a judicious planning of the rotation so that the fields within the rootbreak to be folded by sheep are arranged as near to the farmstead as possible, may lead to a substantial saving in shepherding hours. Another consideration is the type of folding equipment used and the frequency of moving these folds. In this respect, adoption for sheep folding of either the electric fence or the patent fencing posts which are now on the market may prove, in terms of shepherding hours saved, to be well worth the initial capital outlay involved. In any event, in an enterprise of this kind, where labour affords the main opportunity of reducing costs, every conceivable economy which can be effected in labour utilization must be seriously considered if the low direct financial returns normally associated with arable flocks are to be materially enhanced.

References

1. Changes in the Practice of Sheep Farming on the Red Loams of Mid-Devon. S. T. Morris. Seale-Hayne Agricultural College. 1935, *P. No. 45.*

2. Costs and Returns of Feeding Sheep on Roots in Devon. E. T. Davies. Department of Agricultural Economics, University of Bristol. *Report No. 80.*

THE PATTERN OF EAST MIDLANDS FARMING

R. BENNETT JONES, M.Sc.

University of Nottingham, School of Agriculture

A study carried out by the Nottingham School of Agriculture shows that only two-thirds of the agricultural holdings in the East Midlands are "full-time" units and that there are substantial differences in management, stocking, labour, and reliance on purchased feedingstuffs as between farms of varying sizes in the East Midlands.

WHAT is a farm? The Oxford Dictionary defines it as "a tract of land used under one management for cultivation". But even a suburban allotment-garden would come within the scope of this definition, and that hardly tallies with the man-in-the-street's concept of a farm. Where, then, is the line to be drawn between a tract of land which is an allotment and one which can reasonably be regarded as a farm? There are two main approaches to this problem. The first depends on the answer to the question: "Has the occupier other employment or another source of income?" The second approach asks: "What is the value of the production from the holding?" or, "How much labour is required to care for the crops and stock on the holding?"

A special study of the question in the East Midlands has recently been completed at the University of Nottingham. Using labour requirements as a basis, the agricultural holdings in the counties of Nottingham, Leicester, Derby, Lincoln (Lindsey and Kesteven), and Rutland were classified into full-time, part-time, spare-time, and "other" farms or holdings. The full-time farms were then allocated between ten "type of farming" groups. The reason for distinguishing full-time farms from other holdings and dealing separately with each type of farming was that farming itself is so varied that direct comparisons between a dairy farm and a cash cropping farm, or between a market garden and a hill sheep farm, are bound to be misleading. Unless some such subdivision is made, the agricultural statistics consist of an aggregation of figures, from which very few meaningful averages can be obtained.

At June 1947, there were 32,241 agricultural "holdings" in the six counties of the East Midlands. It is estimated that of these only 19,575, or rather less than two-thirds, were full-time* farms. The remainder were part-time or spare-time farms, or odd fields farmed in conjunction with other holdings. Thus, broadly speaking, not more than two-thirds of all the holdings in the East Midlands may be regarded as true farms. But the occupiers of these farms grew 95 per cent of the crops and grass, kept 94 per cent of the cattle, 98 per cent of the sheep, 85 per cent of the pigs, 78 per cent of the poultry, and employed 96 per cent of all the labour.

One-Third Dairy Farms It is clear from this that full-time farms provide the bulk of the production of the East Midlands and that, for many purposes, part-time, spare-time and other holdings may be ignored. Table 1 shows the estimated number of full-time farms of each type in the East Midlands and the average acreage of crops and grass on each at June 1947. The East Midlands is often regarded as a centre of arable farming, yet one-third of the full-time holdings were classified as dairy

* To qualify as a full-time farm, a holding had to have enough crops and stock to require more than 1,800 hours of manual labour per year.

farms. Predominantly arable (cash crop farms with more than 50 per cent of their area devoted to crops for sale) accounted for only 16 per cent of the total.

Table 1

Estimated Number and Size of Each Type of Full-time Farm in the East Midlands

Type of Farm	Number of Farms	Percentage of Total	Average Size–Acreage of Crops and Grass
1. Dairy	6,436	33	87
2. Cropping with dairying important	2,070	10	109
3A. Cropping with pigs	40	1	77
3B. Cropping with poultry	71		64
4. Predominantly arable	2,377	12	185
5. Predominantly arable with some livestock	872	4	132
6. Cropping with livestock of some importance	2,455	13	210
7. Cropping with livestock of considerable importance	1,665	9	167
8. Livestock	2,379	12	111
9. Poultry	325	2	10
10. Market gardens	885	4	22
	19,575	100	124

Pig and poultry farms and market gardens were few in number and small in size, and it is worth noting that in 1947 no farm was classified as a specialist pig farm. Farm types dependent on livestock production tended to be smaller than those mainly concerned with crop production. The average size for all full-time farms (124 acres) is substantially higher than the average of 80 acres for all holdings given in the agricultural statistics. Nearly one-half (46 per cent) of the full-time farms were between 25 and 100 acres in size: only 8 per cent had more than 300 acres and, at the other end of the scale, 2 per cent (mostly market gardens) had less than 5 acres.

Comparing Large and Small Farms It is an interesting fact that, whatever the type of farm in question, much the same kind of differences emerge from a comparison of large and small farms. Table 2 has been prepared to illustrate some of these differences. To enable a comparison to be made between farms in different size groups, the intensity of stocking and cropping is shown per 100 acres of crops and grass, and not on a farm basis. The figures refer to dairy farms, which are by far the biggest group in the Province. Among the first points to notice are the substantial differences between the organization of farms of less than 25 acres and of the larger farms, and the comparatively small differences between the three larger size groups. Except where cash cropping is of first importance, small farms have a lower proportion of their land under tillage crops than do the large farms. In all type groups, as farm size increases, more land is devoted to temporary grass and less to permanent grass. This becomes a matter of importance only if there is a real difference in the production of starch equivalent per acre from permanent grass, temporary grass and tillage crops.

It can be seen from Table 2 that the total livestock density is much higher on the small dairy farms. But this is true only on livestock farms. On arable farms there appears to be little connection between *total* livestock

density and size. For individual classes of livestock the position is quite different. In particular, as farm size increases, the sheep population per 100 acres rises, but the poultry and horse numbers decline. There are generally relatively more pigs per 100 acres on small farms but on several types of arable holdings the pig population per 100 acres increases again on farms of over 700 acres. Numbers of cows and of all cattle per 100 acres decline, as the size of the farm increases, in all the groups mainly concerned with livestock and livestock products, but remain constant in the other groups.

Table 2

Comparison of Organization and Stocking on Dairy Farms of Various Sizes

	Size of Farm (adjusted acres*)			
	5–24.9	*25–99.9*	*100–299.9*	*300–699.9*
Number of farms	563	3,916	1,857	98
Average size (*acres*)	18	55	156	366
	Per 100 Acres Crops and Grass			
Tillage (*acres*)	17.4	27.6	31.2	33.0
Temporary grass (*acres*)	7.2	10.1	12.9	13.2
Permanent grass (*acres*)	75.4	62.3	55.9	53.8
Cows and heifers in milk and cows in calf	48.7	25.7	19.7	15.8
Total cattle	70.6	46.7	42.1	38.4
Pigs	5.4	3.1	2.3	1.5
Sheep	0.8	6.5	12.5	30.1
Horses	4.2	3.0	1.6	1.0
Poultry	558	169	83	32
Total livestock units	72.2	45.0	38.8	37.0
Workers employed (family and hired)	2.28	2.6	2.4	2.6
Persons available (farmer and wife included)	7.7	4.4	3.0	2.9
Labour required (*days*)	1,972	1,202	1,045	968
Days of work required per person available	256	273	348	334

* Counting 6 acres of rough grazing as 1 acre of crops and grass.

There is very little difference between large and small farms in the number of persons (family and hired) employed per 100 acres. But if the arbitrary assumption is made that on all farms the manual labour of the farmer and his wife is equivalent to that of one extra worker, then it appears that the labour force per 100 acres is more than twice as big on small farms, compared with large ones. The difference is even greater if, as seems likely, this assumption undervalues the manual labour contribution of the farmer and his wife on the small farm and overvalues it on the big farm. The figures in Table 2 of labour required are a rough estimate of the intensity of production on farms of various sizes. As might be expected, they show that each person can get through more work on the larger, more mechanized farms.

There are so few specialist dairy farms of over 700 acres in the East Midlands that details for this size-group cannot be given. However, five type-groups (Nos. 4, 5, 6, 7 and 8 in Table 1) had enough farms of over 700 acres to make a comparison possible. The results suggest that these

large farms had slightly more persons available per 100 acres than farms of 300-700 acres, and that these persons each accomplished slightly less work.

The validity of the above comparisons, based on a study of Agricultural Returns, is confirmed by the financial account data available to the University. Small farms have a higher value of production (that is, after allowing for valuation changes and buying store stock) per acre of pigs, poultry, milk and dairy products. Large farms sell more cattle and sheep per 100 acres. As for expenses, small farms have higher "fixed" costs per acre for items such as rent, equipment depreciation and repairs. They do not pay any more per acre for hired labour, and their expenditure on fertilizers and lime is also no greater. Their seed expenditure seems to be slightly more per acre —perhaps because they find it hard to save seed from their own crops. Small farms do, however, spend a great deal more per acre on feedingstuffs.

Net farm income per acre is higher on small than on large farms in the East Midlands, but this is before allowance is made for the manual labour of the farmer and his wife. The hard fact is that the small farm yields the occupier less per acre for his management and his investment than the larger one.

Small Farms depend heavily upon Purchased Feedingstuffs

The importance of livestock and the heavy purchases of feedingstuffs on the small farm prompts the question: "How much of their own stockfood do small farms grow?" Some attempt has been made here to answer this question, in a rough and ready manner for East Midland dairy farms, but it is not easy to determine reasonable average yield figures for many fodder crops; neither is it easy to assess with real accuracy the feed requirements of some classes of livestock. This should be borne in mind when considering the estimates in Table 3.

Acreage figures were available in convenient form for only four groups of crops—namely, oats, other fodder crops, temporary grass and permanent grass. Starting with the official crop yield estimates for Leicestershire and Derbyshire, weighted average yields of starch equivalent were calculated for each of these four groups, making allowance for the acreages of each kind of "other fodder crops" grown, and for the acreages devoted to each kind of hay and grazing. The starch equivalent yield was estimated to be:

	S.E. per acre *lb.*
Oats plus straw	1,620
Other fodder crops	1,900
Temporary grass	1,300
Permanent grass	1,000

These yields were assumed to be constant for farms of all sizes. The differences in average yields given in the table are due solely to variations in the relative acreage of these crops grown on farms of various sizes. Since most dairy farms buy protein feedingstuffs, it was convenient to make all the estimates in terms of starch equivalent. The sale crops referred to in the table are wheat, barley, potatoes and sugar beet. Many dairy farms do, in fact, grow small acreages of these crops, and it is often a better practice to devote some land to crops for sale than to grow beans and other sources of protein.

The figures in Table 3 show that, on average, dairy farms of all sizes were net buyers of feedingstuffs, and that the smaller farms would require a very big increase in acreage in order to be able to grow all the feed requirements

of their stock. It is, of course, possible that these calculations, although based on official yield estimates, understate the degree of self-sufficiency on dairy farms, but they do reveal very clearly the dependence of these farms—and particularly the smaller farms—on supplies of bought feedingstuffs.

Table 3

Comparison of the Starch Equivalent Position on Dairy Farms of Differing Sizes

	Size of Farms (adjusted acres)				Average—East Midlands
	5—24.9	*25—99.9*	*100—299.9*	*300—699.9*	
Estimated deficit of S.E. (*lb.*)*	45,422	55,828	80,646	167,580	68,524
Average yield per acre of S.E. (*lb.*) ...	1,167	1,254	1,294	1,312	1,279
Acreage required to grow deficit	38.9	44.5	62.3	127.7	53.6
Acreage under sale crops	0.8	5.4	19.5	51.2	10.0
Net deficit (*acres*)	38.1	39.1	42.8	76.5	43.6
Present farm acreage	18.0	55.5	156.2	365.6	86.6
Deficit as percentage of present acreage...	212	71	27	21	50

* Stock requirements less production on farms.

It is quite clear that acreage is only one measure of farm size. The above table shows that the small dairy farms of 18 acres were, in fact, using the produce of another 38 acres grown elsewhere. The *true* size of these farms was therefore 56 acres. It is the size of the farm *business* which is of real importance in determining the standard of living attained by farmers. Without a sufficient turnover, economy and efficiency are of no avail. Unfortunately, many small farms are situated in localities where, because of climate and market difficulties, intensification of production is extremely difficult. Many others are unable to provide the capital equipment needed for increased production of milk, pigs and poultry.

THE FIGHT AGAINST WARBLE FLY

W. E. PARISH, B.V.Sc., M.R.C.V.S.

Ministry of Agriculture and Fisheries Veterinary Laboratory, Weybridge

Though difficult to assess, it is known that losses in milk, meat and hides by reason of warble fly attack are very heavy indeed. A pilot experiment to eradicate the fly in the Isle of Wight may give useful pointers for the control of this pest on the mainland of Britain.

THE warble was recognized as a parasite of cattle in Roman Britain. The lumpy backs containing wriggling grubs were generally regarded as just one more peculiarity of nature providing matter for speculation. Nor were farmers of the Middle Ages any better informed; with their more vivid imaginations they believed it to be "witches' business", and the madness that would suddenly seize a whole herd of cattle a result of the evil eye.

Practically no advance was made on those primitive ideas until the beginning of the eighteenth century, when a naturalist named Vallisnieri set himself to discover the insect of which the warble maggots are the larvae, and despite many failures and no little financial loss, he succeeded in obtaining one damaged fly from a grub. The revelation of life histories is a slow business, and two hundred years were to pass before any further progress was made, beyond the finding of similar flies in the collections of a few entomologists, and the realization that there were two species of warble fly—*Hypoderma bovis* and *Hypoderma lineatum*.

Life Cycle Exposed During this period various people became interested in the method by which the larva found its way to the animal's back. They knew that the fly was unable to bite or feed, but stated that the eggs were stuck on to the skin by the sharp lance of the female, and that that was the cause of the gadding. But other naturalists remained unconvinced and ventured the opinion, as was later proved to be true, that the ovipositor of the female was too delicate to stick into anything, let alone the tough skin of the bovine back. Finally, in 1915, it was observed that the adult fly lays its eggs on the legs of cattle, where they are fixed to the hairs by a glutinous clasp.

This observation set the investigators upon the trail of discovering how the warble reaches the back, and by 1922 the combined evidence of several people completed the picture. The young larvae hatch from the eggs in a few days and burrow through the skin, under which they migrate upwards near the tendons to the body, and thence quickly pass to the gullet, or lodge beside the spine. Once there, they grow in size and move to the back, where they make the characteristic lump and stay until they are ready to emerge. Though there are still gaps in our knowledge of this migration, the general story is complete.

The same investigators during the course of their work realized that this parasite was no harmless companion but an insidious evil, lowering milk yields and weight gains of cattle by its poisonous action, adding to the damage caused by its parent's "gadding the cattle" when laying its eggs. A search was made for an effective weapon to control the fly, and in 1922 it was experimentally proved that derris, or its active principle rotenone, scrubbed well into the warble cyst is a hundred per cent effective in killing the larvae. No other insecticide then or now is as good.

The discoveries of scientists are but the first step to progress; their efforts have then to be put to practical use. Means had been found of breaking the life cycle of the fly, but the problem arose of putting it into effect on a large scale. The lean years following World War I were a difficult time for the rigorous application of this discovery. Although the farming community "at home" believed they could forget about the pest, it was not the same story in the colonies. In the island of Cyprus, where cattle are required not only for milk and meat but also as the major source of power on the land, pulling the carts and ploughs, the warble fly was a serious menace. It was no uncommon thing for accidents to be caused by the fear-maddened beasts running away with the plough, or to see them come through the streets dragging the remains of the plough behind them. The authorities finally decided that this constant threat to safety could be removed by concerted action. A campaign was started in which special teams went round the island dressing the affected cattle with derris. Within three years so few warbles remained that a reward was offered to any farmer for every warble he could find infesting a cow.

The success of this scheme, in contradistinction to the relatively poor results obtained in Great Britain, was due mainly to the public support resulting from the dangers of runaway draught oxen and to the determination with which the problem was tackled. The dressing was carried out by men trained for the work, and in such a way that the whole island was covered every year, so that no local areas of warbled cattle remained as a source of infestation the following summer. In a small island community like Cyprus with a limited cattle population this method can be justified economically. Because of the large numbers of cattle and the different type of husbandry, a campaign on similar lines would not be practicable in Great Britain. To set up a State dressing service would necessitate the recruitment of a large mobile force at a time when labour is scarce.

The Warble Fly (Dressing of Cattle) Order of 1948 prescribes that owners and persons in charge of cattle visibly infested with maggots of the warble fly must dress those animals with a derris dressing at monthly intervals between March 15 and June 30. To be effective, the derris should be scrubbed vigorously on the back of the animal so as to disperse the dried pus and scabs which mat around the ulcers; the back should then be thoroughly drenched with more of the fluid. If all farmers were to carry out their obligations under this Order there is no doubt that the damage caused by the warble fly could, within a few years, be reduced enormously, as it has been in some other countries; the effort would be well worth while.

Isle of Wight Eradication Scheme This demonstration clearly shows that derris not only works in the hands of scientists but can also be made to work in the hands of practical men. We think we know some of the difficulties involved in applying it throughout the whole of our country, but there is only one way to find out with certainty: that is to make a thorough practical test in an area of reasonable size. To this end, a pilot experiment is now being carried out in the Isle of Wight.

The Isle of Wight was chosen because the adult fly is unable to cross an expanse of water as wide as the Solent. Teams of veterinary officers of the Ministry of Agriculture are working throughout the season, examining every beast at monthly intervals. Several little points of practical importance have been observed, and several sources of error have been detected, the great importance of which, from a practical point of view, had not been fully appreciated. For instance, long-haired breeds, or those cattle which keep their winter coat, hide the warbles from view and have to be examined by

hand. The hair of these cattle must be clipped over any cysts before dressing to ensure that the warble is properly treated. It has also been found essential to remove the scab from the warbled hide, and that derris exposed to the atmosphere loses its potency between one year and the next or, if left in the wet state, from one dressing to the next.

The information gained from this experiment will be of the greatest use when applied to areas on the mainland. Meanwhile similar methods being used in Holland and Denmark have had such success that few warbles now remain, though constant vigilance has to be maintained in the frontier regions to prevent reintroduction.

Promise of New Insecticides But derris is not the only insecticide we possess. During the last ten years several new preparations have been made which have given magnificent results in the control of other insect pests, and attempts have been made to use these in the control of warbles. Oil sprays of DDT and BHC have been applied to the legs of cattle to prevent the female fly laying her eggs on the hairs, or to kill any larvae that hatch before they have had time to burrow into the skin. Both these preparations, however, even when applied at weekly intervals, failed to give satisfactory control. It was found that BHC, which remains toxic to most insects for long periods when used in buildings, failed to persist for even one week on cattle. The reasons for this rapid reduction in activity are not yet fully understood. The surface area involved, the constant exposure to weather, and the heat of the body assisting evaporation, are possibly the chief factors; but it is also possible that the sebaceous secretions of the skin may coat the insecticide, and the constant rubbing of the legs on herbage and in mud will quickly remove the remainder.

Trials have shown, however, that by using very high concentrations of BHC some degree of residual action is obtained, although the cost of such treatment prohibits its use in general practice. Until it is possible to find a method whereby reasonable amounts of the insecticide remain potent for some weeks when applied to cattle, such treatment cannot replace derris.

Experimental Difficulties Laboratory workers are continually striving to find simpler and quicker methods of eliminating the warble fly. A new line is being explored at this moment by the Animal Health Division of the Ministry in the feeding of phenothiazine and other worm remedies to try and kill the larva during its migration through the body. Results have not been promising, for apart from the difficulty of finding the right drugs, there are many others concerned with the techniques of testing. It takes a year from the time the compound is tested until the results are obtainable, because of the need to count the number of warbles that have survived to reach the animal's back. Furthermore, the individual infestation is so varied that workers are forced to use large numbers of animals. To overcome these difficulties, a technique has been worked out at Weybridge for artificially inseminating the adult flies. Many species of flies will breed in captivity, but not so the warble fly; it refuses to mate unless free in the open air.

For this technique of artificial insemination, the larvae are collected from the backs of cattle in special tins and nursed through their pupation period in the laboratory. As soon as the adult flies emerge, they are placed in small cages, and then, by using special instruments, the semen is collected from the male and injected into the female, from whom fertilized eggs may later be obtained. It is hoped thereby to secure enough young warble larvae for the

infection of laboratory animals, and so enable us to test large numbers of drugs to discover if they will kill the larvae while migrating through the body. The importance of the infection of small animals, such as mice or guinea pigs, lies in the need for facilitating the discovery of minute larvae at post-mortem examination and also for keeping the dose of the drug to a minimum. Chemists find it difficult to make large quantities of new substances, and the requirement for an amount to treat so large an animal as a cow would prohibit that kind of work.

These are developments that may be of value in the future. For the present, we must make the best use of derris. This, we know, is effective. One helpful point appears to be rather generally overlooked—that the emerging fly will not go far in search of cattle but is content to stay in its own area so long as cattle are there. It is due to this peculiarity that the energetic farmer who treats his own herd thoroughly is sure of securing the benefit which his keenness deserves.

THE AGRICULTURE OF SWEDEN

RONALD EDE, M.A., Dip.Agric.(Cantab.)

United Kingdom Agricultural Attaché to Denmark, Sweden and Holland

Since 1947, Sweden has been pursuing a long-term policy designed to increase agricultural productivity. Despite the small area of farmland available and a declining rural population, this policy has been so successful that today output per man is 60 per cent higher than in 1938-39 and self-sufficiency has virtually been achieved.

SWEDEN is geographically one of the largest countries in Europe, with a total land area of about 173,000 square miles. It is some 1,000 miles long and from 250 to 300 miles wide, and 15 per cent of the land lies within the Arctic Circle. But despite its large superficial size, the area devoted to agriculture is, for reasons of topography and climate, only about 9.3 million acres of arable land and 2.45 million acres of what might be described as rough grazings. At the same time, an area of about 55 million acres, or 54 per cent of the land area, is given over to forestry. The population of the country is just over 7 million, of whom about 20 per cent are now engaged in agriculture. Of recent years there has been a rapid decline in farm labour, and it is estimated that the rural population fell by 686,000 persons between 1930 and 1950. But in the last fifteen years, production per man has risen by 60 per cent—a development which might well be described as an economic revolution.

The reasons for this can be traced back to the war in Europe. Despite the fact that Sweden was not engaged in hostilities, the food situation became critical, partly because of isolation and partly as the result of bad harvests. Rationing was severe, and it was decided that Sweden must in future rely on its own resources for its food supply. A Committee was appointed in 1942 to make a comprehensive inquiry into the future of Swedish agriculture, and its recommendations were adopted by the Government in 1947 as a basis of a long-term policy for agriculture. Production was to be encouraged so that the country could meet 90 per cent of its food requirements. In

doing this, steps would be taken to secure for the agricultural population the same standard of living as that enjoyed by other groups in the community and to ensure that agriculture would get an equal share of future improvements in the national standard of living.

Measures to Increase Productivity This policy has been put into practice in two ways. First of all, there is an annual agreement between farmers and the Government as to prices for farm products, based on an agricultural calculation, the income side being worked out by the State Agricultural Board and the cost side being prepared by an Agricultural Research Institute financed by the farmers' organizations. Secondly, the Government decided on a scheme for the rationalization of Swedish agriculture. This included measures to increase the size of farms and improve their layout, and plans for land reclamation, land drainage, better methods of cultivation (including mechanization), more effective use of fertilizers, use of better crop varieties, and improved livestock management.

A policy of price regulation is made much easier in Sweden because the domestic market can virtually be isolated by a quantitative limitation of imports. Prices are not guaranteed for all products, but farmers have so far been able to obtain the prices agreed in the negotiations. Prices are fixed by the Government for bread grains, sugar beet, oilseed crops, and potatoes for industrial purposes. These fixed prices indirectly affect the prices of other products. The prices of coarse grains and bran are affected by the prices for bread grains and by the prices agreed for animal products. The market for eating potatoes is free, but is influenced by the price for industrial potatoes and by the fact that the Government controls the quantity of potatoes to be used for the manufacture of starch and alcohol, according to the size of the total crop.

The price of milk is controlled at what might be described as a maximum, but the trade can sell below this price if it wishes to do so. In the case of meat, a so-called basic price is fixed, and prices charged by the Swedish Co-operative Marketing Association over a year may not exceed this basic price by more than 1 per cent.

The second aspect of Swedish agricultural policy is longer term in character. Technical developments are encouraged to achieve what is known as "internal rationalization". But though this should enable agriculture to maintain its annual rate of increase in efficiency, it is not sufficient to make agriculture as efficient as other industries. The basic problem is the large number of small farms which, in the light of modern technical developments, cannot be operated as economic units.

This difficulty is being met by a policy of amalgamation of holdings, known as "external rationalization". When possible, the farmers are encouraged to do this for themselves with the aid of capital grants, but, in addition, the State has been given priority of purchase, except as between close relatives, where a farm is offered for sale. A farm is bought by the State if it can be used to increase the area and improve the layout of existing farms. The urgency of this problem can be appreciated by the fact that in 1944, out of a total of 414,000 holdings, 320,000 were less than 25 acres in size. A recent census shows that the total number of holdings in Sweden decreased from 414,000 in 1944 to 378,000 in 1951 (or by 8.6 per cent). The decrease took place almost entirely in the number of farms below 25 acres; the number of holdings between 25 and 250 acres showed a slight increase. But despite this evidence of progress, there is some feeling of

disappointment at the results, one of the main obstacles being indifference to this reform among farmers themselves. Local loyalties often allow an old-established but uneconomic farmer to retain his holding.

A report published by the Committee in 1947 gave a number of objectives which might be achieved by 1970, and figures published in 1954 showed that many of these aims had already been achieved. Thus the decline in the rural population of 30 per cent which it was anticipated would be reached by 1970, had already taken place. Not only had self-sufficiency already been secured, but there was a surplus for export; the milk production per cow had been increased by 30 per cent, compared with 1938-39.

Greater Output with Less Labour The outstanding characteristic of Swedish farming since 1947 has been the increased output which has accompanied the declining labour force. Farm wages in Sweden are about the highest in Europe, but the country as a whole suffers from a shortage of manpower. High wages and lack of labour have been powerful incentives to mechanization, and Sweden is now second only to Great Britain in this respect. Between 1950 and 1953, Swedish farmers bought some 50,000 tractors.

The main reason for this remarkable development is undoubtedly the stability of prices, which have been maintained at a fairly remunerative level since 1947. This has given the farmers confidence and they have responded with intensive production. High labour costs have led to many forms of labour-saving, and the innate love of the Swedish farmer for any form of mechanical device has had its effect by increasing the efficiency of production. But prices alone do not necessarily lead to increased production; in fact, high prices may be a reason for sitting back and making no further effort. This has not happened in Sweden. The farmers have been persuaded to use better varieties of crops, to use twice as much fertilizers as in 1939, and to cull their lower-yielding cows. The credit for this may be due partly to the advisory officers in Sweden, but here again the presence of an official advisory service does not ensure that the farmers will take the advice.

The main problem facing the Swedish farmer today is the disposal of surpluses that have arisen because production is in excess of home requirements. Their disposal causes some difficulties, as the internal price level for farm products is some 20 per cent above the export prices in Denmark and Holland. This does not make it easy to compete on the export market. Some products, notably wheat to Western Germany, have been disposed of by a form of barter, but in other cases levies on produce sold on the home market have been used to support export prices.

Mention has already been made of the large area under forests in Sweden, and this is of special importance to agriculture, as farmers own about half the forests. Many holdings which would be too small as a unit in themselves can provide a reasonable living to the owner when run in conjunction with forestry. A typical holding in Northern Sweden might have 15-20 acres of farmland and anything from 100 to 300 acres of forest. Even if the farmer does not have a forest of his own, he can find plenty of employment in neighbouring woodlands during the winter months.

Emphasis on Animal Products The main agricultural areas are found in Scania, in the south of Sweden, and on the plains in the central part of the country. Wheat is the main cereal crop

in the south, and in central Sweden up to 100 miles north of Stockholm. Further north, the main cereals are oats and barley. Of the arable land, 15 per cent is used for wheat and 25 per cent for oats and barley. Sugar beet is grown on about 125,000 acres in the south—sufficient to provide practically all the sugar Sweden requires. Potatoes are grown in all parts of the country and occupy some 375,000 acres. Since the war, rape for oil has established itself as an important crop, and the area is of the order of 250,000 acres, which is capable of providing practically all the raw material needed for the margarine industry. Sugar beet, potatoes, rape and fodder root crops represent about 10 per cent of the arable land. The remaining 50 per cent is used for temporary grass. The average figures for yields have no special significance, however, because many crops are grown on land or in areas not specially suited to the crop. The average yield of autumn wheat for the whole country is 22 cwt. per acre, but in the south farmers are not satisfied with yields below 32 cwt.

Swedish agriculture derives some 75 per cent of its income from animal products, the most important single item being milk, which represents 40 per cent of the total farm income. The number of cows is about 1.5 million, out of a total cattle population of about 2.5 million. The average milk yield from recorded cows is 880 gallons, with a fat content of 4 per cent, but the average for *all* cows is roughly 638 gallons. The predominant breed is the Swedish Red and White cattle, which may be described as a cross between the Ayrshire and the Dairy Shorthorn. The rapid progress of mechanization has drastically reduced the horse population; the total number today is only about 360,000—less than half of what it was ten years ago. Swedish farmers now own more than 100,000 tractors, which means that practically every holding over 25 acres has a tractor. Doubts are occasionally expressed as to whether the speed of mechanization has not been too great, giving rise to an uneconomic use of tractors.

Close Farmer-Government Relationship Swedish farmers have organized themselves very effectively: in the first place, for co-operative marketing of their produce; and secondly, into organizations which can represent their interests in negotiations with the Government. The co-operative marketing societies are very powerful and handle 99 per cent of the milk, 75 per cent of the meat and eggs, and 60 per cent of the bread grains. The local societies are combined into a national body under a central authority, which has been able to reduce distribution costs to the benefit of both producers and consumers.

In addition to their own organizations, farmers in Sweden are subject to a very rigid control which is exercised through a series of local Agricultural Councils. The latter are responsible for the measures for both internal and external rationalization. As a part of the control, these bodies are empowered to decide whether a purchaser is a fit and proper person to be allowed to take over a farm, and can withhold their consent if they are not satisfied that he is. In practice, this means that only bona fide farmers are allowed to buy farms, and that a land speculator or a "week-end" farmer is unlikely to get permission to purchase agricultural land. Acting through these local bodies, the State can also place a farmer under supervision if the Council is satisfied that the farm is being neglected or not farmed intensively enough. The authority vested in these County Agricultural Councils is very nearly absolute and the scheme does not lack its critics, especially among large and progressive farmers who fear that the Councils are exercising too much power.

In spite of this control, there is no doubt of the achievements of Swedish farming since the new policy was adopted in 1947. In the long run the implementing of this policy should enable Sweden to exploit the possibilities of mechanization to a high degree, which in turn must lead to more efficient and cheaper production. Sweden is becoming a highly industrialized country, and the fact has been accepted that agriculture will survive only if it can compete with industry in terms of output per man and if the people engaged in agriculture are able to enjoy a standard of living comparable with that of workers in other industries. A very important factor in this agricultural policy is its strategic aspect, which will be of considerable help to the country if her traditional policy of neutrality should keep Sweden out of any future wars but isolate her from her food supplies.

GLASSHOUSE LETTUCE IN HESKETH BANK

J. G. GILLOW, B.Sc.

National Agricultural Advisory Service, Yorks and Lancs Province

Lancashire's dominant position in the lettuce trade in the northern markets, with their liking for the cheaper, smaller lettuce, gives the incentive for the intensive cropping which is the main feature of the 60 odd acres of glass in the Hesketh Bank area.

LANCASHIRE is easily the largest producer of lettuce, grown both in the open and under glass, of any county in England and Wales. It can also boast the third largest glasshouse acreage, being exceeded only by Hertfordshire and Essex. But, unlike these two counties, the lettuce crop plays a major part in Lancashire glasshouse economy, accounting for about two-thirds of the county's 390 acres of glass in winter and early spring. Just how big a contribution Lancashire makes to the total winter output of glasshouse lettuce can be gauged by the following figures taken from the Ministry's glasshouse returns, as recorded at January 15, 1954:

	Cleared before Jan. 15	Area at Jan. 15	To be planted Jan. 15–Mar. 31	Total
	acres	*acres*	*acres*	*acres*
Lancashire	33	119	103	255
England and Wales (total)				932

Some 60 acres, or about 16 per cent of Lancashire's total acreage of glass, is located in the Hesketh Bank district, which lies close to the holiday resort of Southport. This area, well known for the earliest outdoor lettuce crops in the north, is also one of the most important in the county for the production of glasshouse lettuce.

Many soil types are encountered in Hesketh Bank, including heavy loams, sandy loams, peaty loams, silts, and the true moss. The lighter soils—the moss soils or those derived from moss—are much sought after for lettuce growing, but it is surprising how much excellent lettuce is also produced on basically heavy soils.

GLASSHOUSE LETTUCE IN HESKETH BANK

The permanent aeroplane type of glasshouse predominates in the area, though Dutch lights also play an important part, and there are quite a number of houses of an older design whose dimensions approximate to those of cucumber houses.

In addition to her big lead in production, Lancashire has a distinct advantage in the northern markets, since they will take a lettuce which is not fully hearted by Covent Garden standards—a point that has a big influence on the growing methods employed. Close spacings are used to produce a large number of heads of lettuce per acre, as compared with other systems. The individual head is, nevertheless, quite substantial and, it is claimed, gains in food value and vitamin content what it lacks in bulk. Produced more cheaply, it can, moreover, be supplied at a price well within the reach of the housewife's purse.

Before Christmas, a single lettuce will vary in weight between 1½ and 3 oz., but in spring, with better light, a much larger size is attained, the average for the March lettuce being between 4 and 6 oz.

Intensive Cropping As has already been shown, lettuce is big business to the Lancashire grower—not a catch crop to help with the winter pay packet. On many holdings half the heated glass may be cropped twice with lettuce. Chrysanthemums in the autumn, soil steaming in the winter, and the start of tomato planting in the early spring may cut down lettuce to one crop in the remainder. There are, however, a number of specialist growers who take three crops on one part of the nursery and two crops on the rest. With these growers, the tomato crop is a relatively short one, grown practically cold and rather taking second place to lettuce in the economy. Cold houses normally carry only one crop of lettuce, though even here some growers manage to take two crops on part of the holding.

The table below gives some idea of the timing of the various lettuce crops taken in the houses:

Seed Sown	Planted Out	Crop Cut
Last week August	1st week September	3rd-4th week October*
1st-2nd week September	3rd-4th week September	December
1st-2nd week October	Mid-November	February
Last week October	1st week December	1st-2nd week March
2nd-3rd week November	2nd-3rd week December	3rd-4th week March
Last week December	Last week January	Last week March (or 1st week April)
Last week January (or previous October)	2nd-3rd week February	3rd-4th week April*
2nd-3rd week March	Last week March (or 1st week April)	2nd-4th week May*

* Cold crops

The main heated crops are those maturing in December and March. The crop maturing in February, particularly in the early part of the month, is difficult to handle and expensive to grow. It is not, therefore, tried by many. The autumn lettuce is usually grown cold as a catch crop if tomatoes finish early, and it must mature quickly if the best results are to be obtained. The main cold crop, however, comes in April. The crop which matures in mid-May is speculative; it must be grown quickly to be ready for cutting in the short time between the finish of the main glasshouse lettuce crop and the first cut of the outdoor crop. This form of production is generally confined to the lettuce specialists, but when successful it can be very profitable.

Raising the Seedlings For heated crops, the variety Cheshunt 5B is generally accepted as the right lettuce for Lancashire, although Cheshunt Early Giant is also grown and is often preferred for the quick crops which are sometimes grown in early autumn and late spring. Both varieties are unfortunately rather darker in colour than the northern markets like. May Queen and French Frame (Blackpool) are the varieties chiefly used in cold houses, their light colour making them especially popular in the market.

Seedlings for both cold and heated crops are usually produced in heat under glass, but some are also raised by sowing very thinly in cold frames in October or November. These frame-raised seedlings, which are usually for the January or February planting, are not pricked off, but remain in the seedbeds until they are needed. In the houses seed is sown on beds known as "butts", or in boxes. Very little special preparation is given to the butts and often they are not even sterilized.

The plants are put out as soon as they are big enough to handle. A small seedling is particularly important when planting in steamed soil, since larger plants—for example, those produced by pricking off—will frequently suffer severely from *Botrytis*. The temperature for germination, when heat is used, varies from 55 to 65°F., but after the seedlings are through, the temperature is dropped to about 50° F. to induce sturdy growth.

The use of small soil blocks for growing on seedlings is becoming increasingly popular. The blocks, packed closely together on the floor of a house or on benches, allow plants to be grown on for about a month in a relatively small space, before being planted or stood out in their final quarters. A saving in fuel is achieved and it is also possible to work an extra crop into the programme.

Soil Preparation Soil sterilization by steaming, which has become a routine hygiene measure with many growers, is carried out whenever practicable before the first lettuce crop is planted. Crops on steamed soil are healthy, but growth is often rather unbalanced and there is a greater tendency to marginal leaf scorch ("tipburn"). Sterilization with formaldehyde, which is also practised, gives excellent results for lettuce. A routine soil treatment against the glasshouse symphylid must be given in addition on many nurseries.

The borders are flooded with water as heavily as possible before planting, although in recent years there has been a tendency to give less water than is desirable because, with the very short interval between tomatoes and lettuce, it is difficult to get the soil to dry out quickly enough if it becomes too sodden. Frequently, no more than 5 gallons of water per square yard are applied, though the best lettuces are undoubtedly produced when this can be increased to 15-20 gallons, or even more. Lime is normally applied before the flooding, except on the sandier soils, where it is worked in just before planting because of the danger of leaching. Cultivation is done mainly by machine.

On many nurseries no manure at all is given to lettuce, reliance being placed on manurial residues left by the previous tomato crop. A number of growers, however, like to put in some organic manure, and it is not uncommon for part or all of the annual dressing of stable manure to be put on before the lettuce. There is no doubt that this gives very good results. Hoof-and-horn up to 4 oz. per square yard, or superphosphate in about the same quantity, are occasionally given, while a proprietary tomato base dressing,

supplemented by extra sulphate of potash, is used on some nurseries at the rate of 2-4 oz. per square yard. No clear connecting line can, however, be drawn through the different manurial practices followed, and good results are obtained using the most varied mixtures.

Close Spacing of Plants A Lancashire glasshouse, closely planted with seedling lettuce, just big enough to be handled, is a sight worth seeing. Planting with a line-marker the length of the house, or with a space-marked planting board across the house, or with the multiple dibber—a long rod with dibbers attached at the right spacings—all have their exponents. But the result is the same—a parade ground precision of the rows and an all-way symmetry of plant stations.

Pathways do not bring in money and therefore there is no more than one blank row down the middle of the house, or perhaps one down each side. Walking along them as the crop develops almost calls for the skill of a tight-rope walker! For gapping, additional plants are inserted between the rows adjoining the path. Some growers prefer not to gap, however, because of the labour involved and because it can increase the unevenness of the crop at cutting time.

Planting distances vary, but all are close by southern standards, being anything from 6 to 8 inches. Cheshunt 5B is usually put out at 7 inches square, whereas the coldhouse varieties, such as May Queen, are normally given 8 inches. Planting on the square is most usual, but staggered and diagonal plantings have their supporters.

The economics of close spacing is simply this: at 7 inches each way, just twice as many lettuce can be grown as at 10 inches each way. True, the wider spacing gives a larger lettuce, but it will not be twice the size nor will it command twice the market price. The close spacing means rather more wastage and a higher proportion of seconds but, on the other hand, wide-spaced lettuce take longer to reach full size, and, with heated-house lettuce, this means extra fuel. The decisive factor is that close spacing gives the greater weight as well as the greater number of marketable lettuce per acre. In the northern markets this yields a greater monetary return per acre, even though the price returned per crate of lettuces is lower than that which would be received for a crate of bigger lettuces produced by wider spacing.

Cultural Treatment A temperature of 50-55°F. is usually aimed at for the growing crop, the tendency being to give the higher figure for Cheshunt 5B. Some growers like a slightly higher temperature (60-65°F.) for about a week after planting, but this is by no means general, and good results are still obtained where the practice is not followed.

After planting, the seedlings are sprayed overhead once or twice to settle them in. Subsequent watering practice varies greatly according to the soil and the time of year. On some of the heavier soils, crops are occasionally grown right through to maturity without water (apart from the initial flooding) and do not appear to suffer any ill-effects, but most growers on this type of land give one or two waterings of 2-3 gallons per square yard during the growing period. This is usually applied by hose between the rows, the first watering being given about a month after planting and the second about a month later. On the lighter soils, much more water is given, applications of about 2-4 gallons per square yard being made once, or sometimes twice, a week. Frequent overhead spraying with a hose pipe and rose to supplement or replace normal watering is usually reserved for the spring crop and is rarely started

before mid-February, although some growers who have installed spray lines now spray overhead for both winter and spring crops with excellent results.

Marketing the Crop The state of the market determines the stage of maturity at which the crop is cut. As far as possible, growers like to clear the majority of the crop at one cutting, leaving only a few "seconds" to be cut later. It is, in fact, most interesting to see the lettuce crop being cut, packed and cleared in one operation—the whole job usually being done in the house. In those nurseries where it is the practice to go through the crop several times, there is a risk of losses, due to the difficulty of cutting amongst closely-spaced plants, if the first cutting has been a light one.

The market container is usually the standard lettuce crate, but bushel boxes and other containers are also used. Packs vary from 18 to 36 lettuces to a box or crate. Boxes are lined with paper and another sheet of paper may be used to separate the two layers. The lettuces are not normally washed but before being finally covered they are sprayed to keep them fresh on their journey. The crop is collected by local wholesalers from nearby towns or from the industrial areas of East Lancashire and Yorkshire, although quite a lot of Lancashire's lettuce goes farther afield.

The industrial north is always likely to provide a good market for winter lettuce, and as long as this is the case the efficient production of the Hesketh Bank growers will ensure them a good position in this trade. It will also guarantee the continued importance of winter lettuce in the glasshouse economy of the area.

Virus Yellows in the Mangold Clamps

Improved standards of farm hygiene are helping in the control of virus yellows disease in mangolds, fodder beet, and sugar beet, and, so far as infection from seed crops is concerned, the problem is being overcome. But there remains an equally serious source of infection—the mangold clamp which is retained on the farm after April 1.

Aphids which spread the virus live in clamps during the winter and carry the disease to young root crops in the spring. For this reason, farmers are urged to use up all their mangolds by the end of March, burn the debris, and clear the clamp site. Those who really must have a few mangolds for late use should keep the heaps free from shoots and examine them regularly for aphids.

SOCIETY OF CHEMICAL INDUSTRY

Agriculture Group

FORTHCOMING MEETINGS

1955		
March 21	The Analysis of Fungicides: Sulphur Products	Mr. J. R. Gray
	The Analysis of Fungicides: Organo-mercurials	Dr. R. F. Cropper
April 19	Annual General Meeting of the Agriculture Group, followed by a two-session symposium on "Nitrogen Relationships of Soils and Organic Manures"	Dr. C. Bould Dr. G. E. G. Mattingly Dr. O. Owen Mr. K. Shaw Professor T. W. Walker

Full particulars from the Gen. Sec., 56 Victoria Street, London, S.W.1.

INFLUENCE OF PLANT SPACING ON YIELDS OF WARE POTATOES

V. J. MONTAGUE, B.Sc., and J. D. IVINS, M.Sc., PH.D.
University of Nottingham, School of Agriculture

Experiments at Sutton Bonington suggest that ware growers might, with advantage, try wider spacing of seed potatoes than is at present the custom.

BULLEN and Dadd in a recent issue of *Agriculture* (1) drew attention to the importance of saving money on seed potatoes. An account of a trial conducted at Sutton Bonington may therefore be of interest in this connection. The potato crop, of which the experimental plots were a part, followed a three-year ley. The field had applications of farmyard manure before ploughing and 8 cwt. per acre of an appropriate fertilizer mixture were applied to the ridges before planting. The soil is a medium loam overlying Keuper Marl.

We used sprouted (boxed) seed of King Edward certified S.S. (Scot), and two grades of seed were planted. The drills were 28 inches apart and six planting distances, ranging from 12 inches to 32 inches between plants in the row, were investigated. Planting was done accurately by hand, and apart from spacing and size of seed, all treatments were uniform. The results of this trial are summarized in the following table:

Seed Size 1¼–2 inches			Seed Size 1–1¼ inches		
Spacing in Row *inches*	Total Yield *tons/acre*	Ware Yield (over 2¼ inches) *tons/acre*	Spacing in Row *inches*	Total Yield *tons/acre*	Ware Yield (over 2¼ inches) *tons/acre*
12	25.16	5.63	12	23.91	5.47
16	22.34	5.78	16	21.53	6.09
20	20.66	5.88	20	20.09	6.47
24	19.77	5.91	24	18.96	6.72
28	18.71	5.96	28	18.46	6.88
32	17.91	6.00	32	17.95	7.01

It is apparent that total yield decreased appreciably with increased spacing, and there proved to be a highly significant correlation between these two phenomena. On the other hand, yield of ware (over 2¼ inches) increased slightly with increased spacing up to 32 inches apart. It would appear from this trial that seed, within the size range above, may be planted up to 32 inches apart in the row, without loss in yield of ware. Attention is drawn to the relatively low proportion of ware size produce in the total crop throughout.

Several trials on spacing have been conducted in the British Isles and generally the results have been consistent. In Ireland, Davidson (2) used planting distances of 10, 12 and 18 inches in rows 24, 26 and 28 inches apart. He concluded that where the drill width did not exceed 28 inches, whole seed (grading 1¼-2 inches) might be planted up to 18 inches apart without reduction in yield. The varieties used were Lochar and Great Scot. Findlay and Sykes (3), working with the variety King Edward on a medium silt soil in Norfolk, found that while the total yield fell when seed was planted more

than 12 inches apart in 29 inch rows, the ware yield was not significantly affected by planting up to 21 inches apart. Trials by Tinley and Bryant ([4]) with the varieties Great Scot and King Edward on loams and silty loams in Kent, indicated that the most profitable returns were obtained from large seed (Great Scot 2-2½ inches and King Edward 1¾-2¼ inches) planted 21 inches apart in drills 27 inches apart.

At the Norfolk Agricultural Station the performance of evenly graded seed under different spacing was investigated ([5]). Here total yield was unaffected by differences in spacing from 12 to 20 inches between plants. With 12-inch spacing, however, 29 per cent of the total yield was seed size, and when 16 inch and 20 inch spacings were adopted, the proportions of seed size tubers were 23 per cent and 20 per cent respectively. In this report attention is drawn to the fact that since sprouted seed was used, the proportion of "misses" was small—an important factor when wider spacing is contemplated.

In most of the trials quoted above it was found that the size of seed to some extent determined the response of the crop to wider spacing. Thus Findlay and Sykes ([3]) found that the reduction in total yield due to wider spacing was greater when small seed was used.

The results obtained at Sutton Bonington support previous conclusions that total yield per acre falls with an increase in spacing between setts, but this is accompanied by an increase in the proportion of ware. The figures suggest that ware yield is at least not reduced by increasing the distance between plants up to 32 inches—a distance exceeding those tried by previous investigations. It is conceivable that varieties differ in response to this treatment, and too great reliance should not be placed on the evidence of the results of a single season, although fully confirming previous evidence. It is, however, tentatively suggested that further experiment on the part of ware growers with appreciably wider spacings than those generally adopted might prove profitable. This proposition would seem of particular importance under conditions of high fertility or generous manuring.

The advantages of this practice to the ware grower would be twofold: saving a considerable amount of seed, and reducing the labour and expense of harvesting and handling a large proportion of undersized produce.

References

1. Saving Money on Seed Potatoes. E. R. Bullen and C. V. Dadd. *Agriculture*, 1954, **51**, 111-4.

2. The Potato Crop. Special Experiments Conducted in 1924. W. D. Davidson. *J. Dept. Agric. Ire.*, 1925, **25**, 60-1.

3. Influence of Size of Seed and Spacing on Yield of King Edward Potatoes. D. H. Findlay and E. T. Sykes. *Emp. J. exp. Agric.*, 1938, **6**, 253-61.

4. The Relation between Size of Seed and Planting Distance. N. L. Tinley and D. M. Bryant. *J.S.E. Agric. Coll. Wye*, 1939, **44**, 120-33.

5. Potatoes—Time of Planting and Spacing Trials. *Norfolk Agric. Sta. 44th Ann. Rep.*, 10-1.

FARM BUILDINGS AT OXFORD UNIVERSITY FIELD STATION

M. H. R. SOPER, M.A.

Department of Agriculture, University of Oxford

Taking over a new farm or changing the policy on an existing one frequently entails converting or modernizing the farm buildings. The following account of the way the job was tackled at the Oxford University Field Station may be of interest to farmers faced with a similar problem.

IN 1950, the Department of Agriculture at Oxford took over a farm only 3½ miles from the city, with the twin aims of developing it for research and for teaching purposes at the graduate and undergraduate levels. The total area is some 330 acres, of which nearly 150 are liable to flooding by the Thames in a wet winter, while a further 150 acres range from a stiff Oxford Clay to clay gravel colluviums. In addition, there are some 30 acres of terrace gravel.

The layout of the farm buildings, most of which dated back to the late eighteenth and early nineteenth century, showed that the farm was originally planned for summer milk production and summer fattening; there were two cowsheds (with ties for some 40 cows), a bull pen and calving box, a barn, cart lodge and stable, and a hovel in which apparently the calves were kept. Most of the roofs had been renewed in the late 1930s and were in excellent condition, but much of the weather-boarding on one cowshed and the barn had slipped and was rotting away. Neither cowshed would have met the qualifications required for an accredited licence at that time. There was no electric light, and the only water supply was a well in the farmhouse floor, so that all the milk had to be carried by hand some 50 yards to the farmhouse for cooling. The buildings were grouped on three sides of a square, of which the farmhouse formed the fourth side, and the central yard became a morass in the winter months. The general condition in 1950 is shown by the photograph opposite.

Before the buildings could be replanned, it was essential to decide the future policy for the farm. It was clear that much of the higher-lying land on the clay would have to remain as arable to provide facilities for experimental work. A dairy herd would obviously have to be the mainstay of the farm, with beef cattle as a secondary enterprise (much of the riverside pasture appeared capable of fattening cattle), while a sheep flock would be more or less out of the question owing to the wetness of the farm during the winter. It was also decided that a pig herd would be a valuable asset, particularly for folding on short-term leys. The housing requirements, therefore, were: (1) either a cowshed for some 40 cows or a milking parlour with dairy; (2) winter yards for the dairy stock to prevent poaching; (3) isolation boxes and calf pens; (4) storage facilities for the produce of some 100 acres of cereals; (5) an implement shed and repair shop; (6) accommodation for fattening pigs to bacon; and (7) a Dutch barn.

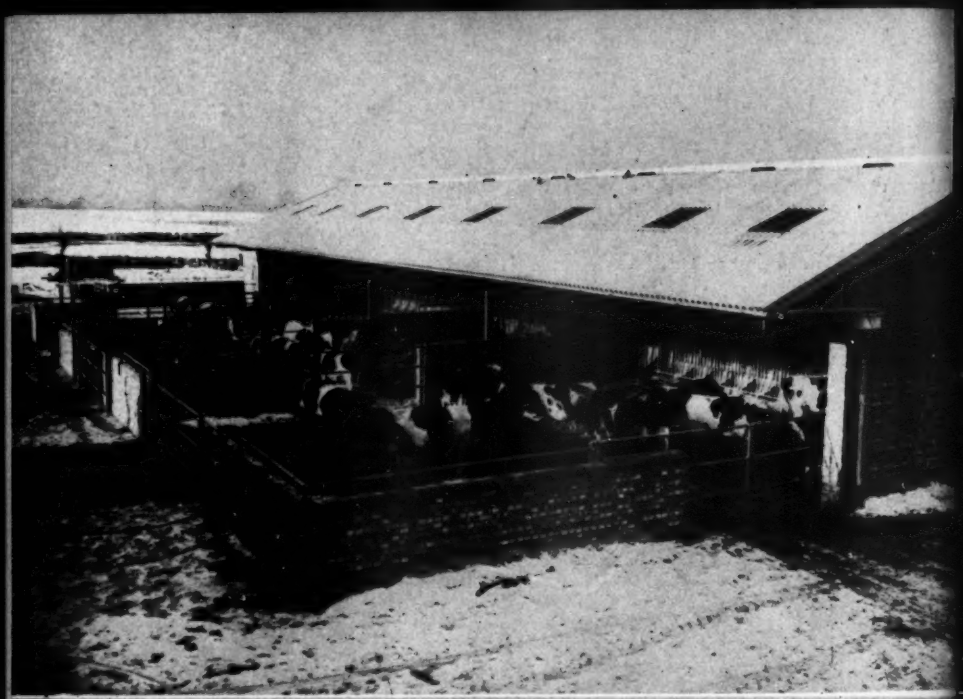
The general plan decided on was to convert one of the cowsheds to a milking parlour and dairy, the other to calf pens and isolation boxes, and to build new stockyards behind the milking parlour. The old stable was not required as such, and this was to be converted to a repair shop, with an old cattle hovel behind it forming an implement shed. For food mixing and

Photos: *A. J. Goldfi*
Sport and Gen

Farm Buildings at Oxford.

The original buildings were grouped on three sides of a square.

Range of boxes and calf pens adapted from old cowshed (on right above).



Photos: *Sport and General*

Farm Build at Ox

The new stockyards.

Eight new pig sties and two boar pens were erected.

Photos: *Sport and Genera*

ild at Oxford.

A well-planned milking parlour.

Each calf box contains six individual pens.

EAST MIDLANDS FARMING (Article on pp. 569-73)

(One-third of the full-time holdings in the East Midlands are dairy farms.

storage, it was decided to run the two existing boxes and the barn together, and to put a reinforced floor into one section of the barn. No other buildings were available to convert for pig fattening, and it was decided to build an entirely new unit, and also to erect a new Dutch barn.

Milking Parlour and Dairy On making plans for the parlour, it was found that the internal width between the plinths of the existing cowshed was only 17 feet—in my opinion too narrow for a well-planned parlour of orthodox design. I also believe that there is a good deal of wasted labour in the standard parlour, due to two workers trying to do no less than seven separate jobs, and probably not doing some of them properly. These jobs consist of: (1) bringing in the cow; (2) tying her up; (3) feeding; (4) washing; (5) milking; (6) stripping; (7) letting the cow out. In addition, there is often the extra task of changing over yards. With two men trying to do so many jobs at once, frequently crossing and recrossing each other's paths, there is a sense of rush and hurry and noise, so that the common criticism levelled at milking parlours—namely, that the cow gets no individual attention—is only too often justified.

It was therefore decided to swing the parlour round, so to speak, and to divorce the unskilled jobs of bringing in and washing, which can be done by a boy, from the skilled job of milking. The parlour was accordingly constructed on a kind of tandem principle, with four washing stalls at the back, and three *single* abreast milking stalls in front under the sole charge of the cowman. As originally planned, the cowman's only jobs were to receive the cow already washed, tie her up, milk and strip her. He could thus manage three units very easily and have time to study each one of his cows individually. In addition, he only had a distance of 15 feet to walk to deal with each group of cows.

The yards were designed with mangers in which concentrates could be fed, but as they were not finished when the parlour was completed, temporary troughs were put into the parlour standings. It was not expected that the cows would have time to eat their concentrates while being milked, but in practice they are able to do so, and after two years this system is still being used. Only the hay is fed in the yard mangers. Yields do not appear to suffer—as shown by the fact that the first 30 non-pedigree Friesian heifers to complete their first lactations have averaged 930 gallons, and the first fourteen second lactations have averaged 980 gallons. The highest individual second lactation was over 1,500 gallons on twice-a-day milking.

The main criticism of this layout is the loss of time in getting the cow from the washing to the milking stall. In practice, this amounts to some 25 seconds per cow, but the advantages of better individual attention and of labour simplification greatly outweigh this small disadvantage.

Milk is carried through an auto-recorder direct to the churn. The churn is taken out, and then picked up by a small, travelling electric hoist fixed to an overhead rail, which carries it to an immersion cooler tank. Here it stays until shortly before collection, when it is again lifted by the hoist on to a loading platform outside a sliding door.

In the reconstruction of the milking shed, the existing roof was supported on hydraulic jacks, and a new brick wall was built up beneath on the foundation stone plinths. The roof was then lined with composition board, plastered over and distempered. Fluorescent lighting was fixed behind the washing and milking stalls.

Calf Pens and Loose Boxes The major part of the second cowshed was converted into loose boxes and calf pens by first removing the whole of the front dwarf wall, the wooden sliding shutters above it, and some 4 feet of the roofing, and then by building up a new, taller brick wall, with lateral divisions to make individual boxes The remaining roof was jacked up while the new front wall was built in. Each box measures 10 feet × 9 feet and has a water-bowl and a built-in concrete manger. There are two calf boxes, each containing six individual pens in two rows of three and divided by removable tubular metal partitions, and a central gangway.

Concrete is a most unsuitable flooring material for young stock, particularly calves, during the winter months, and two experimental floors have been laid in the two pens. The first consists of gravel laid over 18 inches of hardcore, and the second of hollow earthenware bricks laid over concrete sloping to a central drain. This latter arrangement has the advantage first that there is no condensation on the bricks, whose air spaces give excellent insulation, and secondly that urine can drain through easily and make its way out of the pen through the drainage channel beneath the bricks. From the experience of two winters, this set of pens is drier and warmer than those laid directly on gravel.

The Barn Provision had to be made on the farm for grain storage, food mixing and grinding, and temporary storage of mixed meals. The main alteration to achieve this was to remove a wall between one end of the barn and the two adjoining boxes, so that the latter could be run together and used for the mixing and storage of meals. The section of the old barn, some 25 feet deep between the main doors and the two boxes, was adapted for storage by putting in an upper floor of reinforced concrete and a brick lining to the walls. Bins with removable wooden sides, designed to hold 50 tons of grain, were constructed on the two floors, while the upper floor had a large grain hopper fitted at the end of the centre gangway. This hopper is connected to an automatic hammer mill below, which blows the meal back to an enclosed meal bin upstairs beside the hopper. This bin has a chute in the floor, which discharges alongside the food mixer. In this way, it is only necessary to fill the hopper with grain, perhaps overnight, and then bag off the meal when it is needed at the mixer in the morning, thus avoiding a great deal of needless handling. The food mixer is of the vertical type with a capacity of 10 cwt., and is used for mixing both cow and pig foods.

With a farm growing 100 acres of cereals and relying entirely on the combine harvester, provision must be made, under present-day conditions, for storing up to 150 tons of grain. After three years experience of storing grain in sacks, with the consequent wastage from vermin and the high cost of sack damage, it was decided in 1953 to install both a sack drier (required in any case for experimental purposes) and proper storage bins. With only a limited area available for storage in the remainder of the barn, steel-sided silos were selected, and a bank of four, each of 18 tons capacity, were erected along one side of the barn. This installation has left adequate room for the cleaner and for approximately 250 sacks of grain waiting to be dressed. Pits have been dug for filling and emptying each silo by means of a portable elevator. The sack drier, with a 60-sack capacity, lies beyond the end of the barn, and access is through a door in the end wall. Metal runners are used for getting the sacks through to the cleaner. In the light of experience last year, it is suggested that a large sack drier is preferable to a small one, and that it is better to overestimate rather than underestimate one's requirements.

A serious problem arose in planning the silos, for the bracket supports of the main roof beams would have cut into the centre of three bins, and it appeared likely that it would be necessary to shape the bins (a very expensive job, even if it were feasible). However, a simple solution was suggested—namely, to cut away the supports entirely and substitute for them a rolled steel joist running vertically from the floor to the underside of the beam in the middle of each bin. This alteration has given entirely satisfactory results.

The total cost of buying and installing the bins, providing pits, elevator, heater, fan, sack-drier and roofing to cover it, has been almost exactly £1,100—an investment which should very soon pay for itself, particularly if the next few summers resemble that of last year!

Stockyards and Implement Shed As originally planned, the stockyards were to have been fully covered, with the feeding passage and mangers lying on the opposite side of the yard to the parlour. But owing to the need for economy, only half the area could be roofed and, for obvious reasons, the half containing the feeding passage was chosen. At first sight, this arrangement appears to be a waste of roofing, but when concentrates and hay are to be fed, there is much to be said for fully protecting the mangers from the weather, and there is, in fact, still sufficient room for the cows to lie under shelter in really bad weather. The yards are divided into three sections, with ties for 15, 10 and 15 respectively, so that heifers and high yielders can be yarded separately.

One problem of open or half-covered yards is to find a floor which is porous enough to be free-draining but strong enough to stand up to the back-wheel spin of a tractor fitted with a fore-mounted dung-loader. Ordinary dense concrete with drains seldom seems satisfactory, for water moves hardly at all laterally through densely compacted straw, and the drains soon become ineffective. The result is a morass in a wet winter. A different flooring has therefore been laid in each section of the yards. In the first there are 18 inches of hardcore and 6 inches of cinders heavily compressed by a steam-roller; in the second there are pitched Cotswold stone blocks with small stone above, compacted in the same way; in the third there is very porous concrete, made with gravel aggregate and cement, with one shovelful of sand to each mix. It is hoped that some useful information may be available, in time, on the qualities of the different types.

Although the yards were intended to have tubular divisions, it was found at the time of building (1951-52) that it was just as cheap to work in brick, which has a considerable advantage in protecting the stock. The gates, however, are of 2-inch tubular steel, sliding through sockets let into the centre of upright rolled steel joists. These gates slide right out of the way of tractors, trailers, dung-loaders, etc., and are heavy enough to require no fastening mechanism whatever. The only essential is to keep the sockets well greased, and in any further construction, grease nipples would be added. Adjoining the yards are two bull pens of standard design but sharing a common service crate. Feeding is from the same passage that serves the stockyards.

With approximately £5,000 worth of machinery and experimental equipment to be covered, a good implement shed was a necessity, and the old cattle hovel appeared to be the most promising building for adaptation, particularly as it adjoined the proposed repair shop. Only a stone wall, comprising three sides of a rectangle and some 7 feet high and 18 inches wide,

remained after the roof was stripped. The top of this wall was rendered and 6 feet of brickwork was erected on it. A double-span asbestos roof with steel uprights and framework completed the cover, while the bottom of the old yard was filled in and concreted over. A large sliding door 12 feet high and 10 feet wide (high enough to take a combine and green crop loader) closes the shed completely. The result is a really first-class machinery store.

The Pig Unit The pig breeding stock, amounting to some 16 sows, are housed in wooden huts in electrically-fenced pens on temporary pasture, and the young pigs stay out in the field till they are weaned at eight weeks old. Entirely new housing had to be provided to carry these pigs on from weaning to bacon weight. Taking into account the many unsatisfactory Danish-type houses built in this country before the war, the relatively mild climate, and the money available, it was decided to build a range of sties, rather than a fattening house. Eight sties and two boar pens were erected, each having relatively small sleeping quarters and an outside lounging yard with feeding trough. These pens were designed to hold up to 14 pigs, as it was intended to rear each litter separately as part of an experimental project. In order to feed this number without congestion, the food troughs run the length of the outside yard rather than the breadth, with a small feeding passage to serve two pens. A prefabricated slab 15 feet long lies over the full length of the feeding trough, with a perforated water-pipe below. The slab provides shelter from draughts, and the water is controlled from a tap outside the pen.

A novel feature of the outside pen is a dwarf wall running parallel with the dividing wall between two pens. This has a dual function: it provides a dunging passage (and most litters use it for this purpose), and it greatly facilitates weighing. The litter is put into its sleeping quarters, the machine run up between the dwarf wall and the dividing wall, and each pig is taken in turn through the machine.

The pen walls are constructed of 9-inch hollow concrete blocks, and the floor of the sleeping quarters of hollow earthenware blocks faced with ½-inch concrete. As a result of trials during the 1952-53 winter, each pen is now provided with a hollow brick platform 6 feet × 8 feet laid on the existing floor and kept in place by a wooden baulk. This ensures a warm, dry bed in the winter, which can be easily lifted and cleaned. One of the failures in these pens is the roofing, which consists of unlined corrugated asbestos. There is a good deal of condensation on the inner surface during the winter months, and it is intended to line the inside as soon as possible.

No account of the buildings would be complete without a mention of the new cottages, of which there are four, for the farm workers. They are three-bedroomed houses of cottage type, with smallish parlours, but a large, warm kitchen/living room with cook-and-heat stove, a scullery with electric cooker point, bathroom with airing cupboard, and a large built-in outhouse.

Nothing Elaborate or Expensive The inevitable question is, what did it all cost? It is unfortunately impossible to give an exact figure, for the modifications to the farm buildings were part of a much larger and more comprehensive building contract, which included the provision of a field laboratory, a sewage disposal scheme, extensive laying of concrete, and various other items required for experimental purposes. If an exact figure could have been determined, it is probable that the interest on it would have increased the rent to approximately £4 15s. per acre, but the object of this article is not to justify the complete re-equipment

of a farm, but rather to show what can be done with individual buildings whose separate costs amounted to a relatively small figure. Nothing elaborate or expensive was put up, and in the planning the thought was always kept in mind that the modifications should only be those which a good landlord might carry out for a good tenant, and that the cost should not exceed what that landlord could afford to provide, or the tenant to pay in interest.

DEVELOPMENT OF THE DRIED PEA SEED APPROVAL SCHEME

J. D. REYNOLDS, N.D.A., C.D.A. (Hons.)
Home Grown Threshed Peas Joint Committee

The Dried Pea Seed Approval Scheme has been built up over the last ten years from small beginnings. In the early years stocks were appraised from small-scale observation plots, whereas in 1954 some 8,000 acres of crops were field-inspected. The scheme has resulted in a marked improvement in the quality of British stocks of marrowfat peas.

THE genetic instability of many varieties and strains of peas is well known and was clearly demonstrated in the Second World War. During this period seed supplies could not be replenished by imports and the inevitable multiplication of existing stocks—chiefly marrowfats—year after year, aggravated by lack of selection work and rogueing attention in the field, resulted in degeneration. Mechanical admixture at different stages was also common, with the result that by the end of the war the majority of marrowfat crops grown for harvesting dry contained a very high proportion of taller types and very tall rogues, as well as purple-flowered plants introduced through contamination with dun and maple peas. The types of rogues occurring in marrowfat peas (which have white flowers) have been described previously in this JOURNAL (1).

It was to stem this deterioration and to improve the standard of purity and trueness-to-type of the seed stocks available that the Home Grown Threshed Peas Joint Committee embarked, soon after its inception in 1944, on a scheme of seed improvement for the benefit of both growers and the trade. The grower appreciates a uniform crop to ensure even ripening and, in consequence, easier harvesting and minimum loss. Some tare-leaved rogues can yield up to 30 per cent *less* than normal plants (2); others give rise to smaller seeds (3), leading to lack of uniformity. Tall and purple-flowered off-types frequently flower for a long period, so their presence is not conducive to even ripening. As regards the trade, seedsmen constantly strive to ensure that their consignments are uniform in size and shape, true-to-type and free from impurities, and pea picking and packing firms naturally prefer uniform deliveries for processing. Evenness of sample obviously contributes to the attractiveness of dried packet peas, and is also of great importance in "processed" peas. Tall rogues produce some round seeds (as indeed do the uppermost pods of normal plants where ripening is delayed) which take longer to absorb water than the normal dimpled marrowfat seeds. This results in uneven texture in the can or when cooked by the housewife. Purple-flowered plants in commercial crops are also a bane to canners, since the seeds produced turn brown or black during processing.

DEVELOPMENT OF THE DRIED PEA SEED APPROVAL SCHEME

Development of the Field Approval Scheme From the beginning the development and operation of the Approval Scheme have been made possible by the co-operation of pea merchants and seedsmen. Under the Pulse (Control and Prices) Order, 1943, fixed guaranteed prices were applied to growers' produce, and the price of seed supplied by merchants was also controlled. In consequence, much of the acreage was grown under contract, and firms were not averse to participating in a scheme when they were bound to receive back the produce. Thus in 1944 seed firms were invited to submit samples of their best stocks for sowing in observation plots under the auspices of the Seed Production Branch of the National Institute of Agricultural Botany. The 47 stocks entered were graded for purity, uniformity and trueness-to-type, and the 17 participating firms were advised of the results. Similar arrangements were made in 1945, when 21 firms entered a total of 60 stocks.

These comparative plot trials did much to focus attention on the importance of seed improvement, but by 1946 the need was felt for a wider scheme in which growers could collaborate and stocks of a superior standard could be given some recognition. Accordingly, after consultation with the Seed Production Branch (S.P.B.) and the Seed Trade Association of the United Kingdom, it was decided in 1946 to launch a full scheme of inspection of marrowfat crops *in the field*, following the judging of observation plots of the stocks entered, as in the previous years. This new project was known as the "Harrison's Glory Pea Seed Approval Scheme". Firms were advised of the findings on the observation plots and, after allowing time for rogueing, field inspections were carried out by technical officers of the S.P.B and the Joint Committee, approved crops being placed in one of three grades. Declarations of Approval were then awarded to firms, together with special sack labels with the appropriate designations and bearing the certification trade mark (registered in 1947) of the Joint Committee. Being essentially a field approval and not a certification scheme—which implies control at all stages—reliance was, and still is, placed on firms' good faith to apply the labels solely to the seed intended and to destroy any surplus labels.

The scheme was continued on similar lines in 1947 and 1948, when entry was restricted for the first time to stocks of known origin, and a definite method and precise standards were laid down for the field inspections. Judgment in the field in 1946 and 1947 had been based on a general visual survey of the crop, the chief criterion being the density of rogues seen to be present. Such an arbitrary method was not considered very satisfactory, particularly for borderline cases. A sampling technique was therefore introduced, a guide to the maximum number of rogue types tolerable for stock seed purposes being obtained from American practice ([4]). The development of the scheme may be judged from the following results:

	1946	*1947*	*1948*
Firms submitting stocks	19	19	21
Stocks entered	78	120	112
Stocks approved on observation plots ...	44	51	103
Growers' crops inspected	115	146	256
Total acreage inspected	2,216	3,306	5,688

Attempt to Meet National Demand During 1948 the Joint Committee took steps to place the scheme on a permanent and, as far as possible, self-supporting basis, envisaging the time when large imports of seed would be unnecessary. In consultation with the technical staff of the S.P.B., details were worked out to cover the *national*

marrowfat acreage grown for both seed and consumption. Assuming a total acreage of 125,000 (in 1948) and a five- or six-fold net rate of multiplication, the aim was that ultimately *all* crops grown to produce peas for consumption would be sown with the progeny of seed inspected and approved in the field. In terms of figures, the intention was to ensure 10,000 tons of Once-grown Field Approved Stock Seed being available every year to sow 100,000 acres of consumption crops, the remaining 25,000 acres being devoted to the production of seed for subsequent years' consumption crops.

To ensure continuity of supply for such a self-supporting scheme, it is essential to have a constant source of Mother Seed originating from single-plant selections. Under the Pulse Order, plant breeders and seedsmen had no real incentive to carry out selection work and introduce new strains, but under the new arrangements the N.I.A.B. agreed, subject to certain conditions, to offer help in the testing and multiplication of new Mother stocks emanating from official sources. It was arranged that if such stocks proved comparable or superior to existing stocks as a result of trials, they would be eligible for entry as Mother Seed under the scheme.

The years that followed saw a decline in the marrowfat acreage; in addition, experience showed that the multiplication rate adopted was too optimistic. The scheme's requirements therefore had to be adjusted, and the following diagram sets out the different "stages" at the present time.

Diagram showing Annual Operation of Scheme to meet National Requirements
(Multiplication rate adopted: 4.5)

Stage A
Inspected in the field, Declarations of Approval issued, and sack labels made available for produce.

Stage B
Inspected in the field, Declarations of Approval issued, and sack labels made available for produce.

Stage C
No field inspection, but registration of all crops grown and utilization of any balance. Sack labels made available for produce.

Stage D
No field inspection, nor registration.

All "stages" are repeated each year, and three years elapse from the field approval of Mother Seed to the production of the commercial commodity. Owing to the continued shortage of Mother Seed, however, the scheme at

present virtually operates from Stage B onwards. Ideally, the crops sown under Stage C should be inspected, but lack of time and staff make it impossible to examine the very large acreage involved.

Early in 1949 the amended Scheme was accepted as an "Approved Scheme" by the Seed Production Committee of the National Institute of Agricultural Botany, and the title was changed to the "Dried Pea Seed Approval Scheme".

How the Scheme Works The scheme is open to members of the Pea Pickers and Pea Packers' Association, as well as to seedsmen who can undertake the rogueing of crops entered. Stocks of marrowfat varieties for harvesting dry are eligible for entry only if they fall in one of the following categories:

MOTHER SEED

Newly-released stocks of known origin resulting from a selection or crossing from seedsmen or plant breeders, subject to the approval of the Joint Committee.

FOUNDATION SEED

1. Seed graded as Field Approved Foundation Seed the previous year.
2. Newly-imported Dutch certified marrowfat seed.
3. Field Approved Stock Seed which reached a particularly high standard in the field the previous year (but only in the event of requirements not being met from 1 and 2).

Details of crops for inspection have to be submitted, accompanied (except for new Dutch seed) by representative samples of stocks entered, for sowing in observation plots.

Results of the inspection of the observation plots, which is made by a panel representing all interests, are sent at once, and field inspections (unless not required by the grower) begin soon afterwards. Assistance in examining the stocks, both on the observation plots and in the field, is given every year by technical officers of the S.P.B.

Field inspections begin each year about June 20. Working in pairs, the inspectors walk round and through each crop, the grading being based on the following factors:

FACTORS RESULTING IN DIRECT REJECTION

1. Stock character masked by excessive weediness, disease or pest damage, or atypical growth caused by abnormal growing conditions, including advanced maturity.
2. Peas of any type grown on the same land the previous year.
3. Crop not separated from adjoining peas by a hedge, dyke, road, etc., or by a distance of at least 10 yards.*
4. Crop more than mildly attacked by Leaf and Pod Spot (*Ascochyta* spp.) or any other disease, such that the resulting seed may be infected or of dubious vitality.

UNIFORMITY OF STRAIN AND TRUENESS-TO-TYPE

With Foundation Seed crops, taller, coarse plants are penalized. Mother Seed crops can also be rejected on the grounds of a too high proportion of taller, coarse plants, but this seldom happens in practice.

* It is quite permissible for such a gap to be sown with any other crop.

DEVELOPMENT OF THE DRIED PEA SEED APPROVAL SCHEME

PRESENCE OF ROGUES AND OTHER OFF-TYPES

In the case of Mother Seed crops, the inspectors walk round the headlands in opposite directions to establish that there is adequate separation from any adjoining peas and to check the absence of varietal contamination. On the way back, sample counts are made at intervals in the crop. This sampling, introduced in 1948, consists of counting the off-types present in a circle of 0.025 acre. After carrying out the requisite number of counts, which depends on the crop acreage, an estimate of rogue types present per acre can be calculated. The different rogue types are penalized and, if the aggregate of penalties allocated exceeds a predetermined figure, the crop is rejected.

The sample count method was also used in the earlier years for Foundation Seed crops, although with less strict standards, but since 1951 another technique has been developed to gain a better picture of uniformity and trueness-to-type. The same procedure is adopted as regards examination of the headlands but, in addition, the numbers of off-types seen are recorded. When the inspectors return to their point of entry they follow semi-circular routes *through* the crop, again counting any off-types observed. This technique gives a satisfactory picture of the *whole* crop. Again, predetermined standards decide the verdict.

The grades awarded are defined as follows:

Mother Seed Stocks (*Field Approved Foundation Seed*). Exceptionally uniform and true stock, entirely free from tall and purple-flowered rogues and almost free from other rogue types. Suitable for growing on again for production of high quality Stock Seed.

Foundation Seed Stocks (*Field Approved Stock Seed*). Very uniform and true stock, free or almost free from purple-flowered rogues and other rogue types. Suitable for growing on again for the production of seed for sowing crops destined for consumption.

The progress of the new scheme since it was started in 1949 can be seen from the following figures:

	1949	*1950*	*1951*	*1952*	*1953*	*1954*
Firms submitting stocks ..	24	26	23	17	20	24
Stocks entered	64	77	64	72	74	100
Growers' crops inspected ...	217	244	240	219	334	341
Total acreage inspected ...	3,793	5,047	5,292	4,551	7,924	7,975

Crops for inspection are located in the pea-growing eastern counties from East Yorkshire southwards to Kent, but chiefly in the area of the Wash. Distribution roughly follows the county acreage figures for peas harvested dry.

Declarations of Approval and rejection notices—the latter giving the reason for rejection—are issued to firms soon after the inspections are completed. Approval is followed by certificates authorizing the use of the Joint Committee's certification trade mark, subject to acceptance of the regulations governing its use. Label requirements are assessed from firms' estimated average yields after cleaning, the grades of seed being distinguished on the labels by colour—white for F.A.F.S., yellow for F.A.S.S., and green for Once-grown F.A.S.S.

To keep a complete record of the progeny of approved crops, it is necessary to control the transfer and disposal of such seed. All merchants handling any class of approved seed must therefore obtain written permission from the Joint Committee before using it for purposes other than for reproduction.

DEVELOPMENT OF THE DRIED PEA SEED APPROVAL SCHEME

Marked Improvement in Seed Stocks With no official control following field inspection, the scheme obviously cannot be watertight. This is borne out by the figures that follow, which indicate the considerable losses between Stages B and C.

Acreages of Different Classes of Approved Seed Grown, 1949-54

(Rate of multiplication: 4.5)

Annual National Requirements of Scheme (*a*)	Stage A Foundation Seed 1,100	Stage B Stock Seed 5,000	Stage C Once-grown Stock Seed 22,500	Stage D Seed for Consumption 100,000	Total 130,000
			(*b*)	(*b*, *c*)	(*b*)
1949	10	2,398	6,500	—	—
1950	86	3,705	7,000	30,000	41,000
1951	53	4,061	11,000	32,000	47,000
1952	79	2,955	6,500	50,000	60,000
1953	54	6,118	10,000	30,000	46,000
1954	32	6,160	15,000	45,000	66,000

(*a*) As at 1954; (*b*) Approximate figures; (*c*) Theoretical figures based on acreage under Stage C the previous year.

Besides inevitable losses at the farm and those due to unsatisfactory seed quality, there is considerable leakage in merchant-to-merchant transactions, chiefly because it is not always sold as *approved* seed, and does not therefore receive the attention it deserves. With the limited supervision available, however, the scheme does go some way towards achieving its goal, and it is generally acknowledged that it has contributed significantly to the marked improvement in the standard of the seed stocks used in this country. Growers are becoming increasingly conscious of the value of approved seed, and the special sack labels act as a good advertisement in this respect.

Further particulars of the scheme will gladly be sent on application to the Home Grown Threshed Peas Joint Committee, Research Station, Yaxley, Peterborough.

References

1. Rogue Seed in Harrison's Glory Peas. J. D. Reynolds and C. North. *Agriculture*, 1948, **55**, 110-3.
2. H. Lamprecht. Plant Breeding Institute, Weibullsholm, Sweden. (Private communication.)
3. Seed Variation in Pea Rogues. D. E. Yen. *N.Z. J. Sci. Tech.*, 1954, **36**, A, 117-21.
4. Seed Peas for the Canner. D. N. Shoemaker and B. L. Wade. *U.S. Dept. Agric. Fmrs. Bull. No. 1253*, 1937, 9.

Institution of British Agricultural Engineers Scholarships

The Council of the Institution of British Agricultural Engineers announce that they are awarding two scholarships to students undertaking the year of study leading to the final examination for the National Diploma in Agricultural Engineering. Both scholarships will be awarded for the session of study for 1955-56 and will be applied for the benefit of approved candidates for the final examination who would experience difficulty in undertaking full-time study at an approved college without financial assistance.

Full particulars, together with forms of application, may be obtained from the Secretary, The Institution of British Agricultural Engineers, 24 Portland Place, London, W.1. The closing date for the receipt of completed application forms is May 31, 1955.

WINTERING STORE CATTLE

COCKLE PARK TRIAL, 1953-54

PROFESSOR H. C. PAWSON, M.B.E., M.Sc., F.R.S.E., and P. INNES, B.Sc.
King's College, Newcastle-upon-Tyne

Feeding trials to compare the relative merits of different systems of winter managing young store cattle were again conducted at Cockle Park in 1953-54, using Beef Shorthorn calves born in the spring of 1953 and suckled by their dams until October.

SINCE the first report of these feeding trials at Cockle Park appeared in this JOURNAL in November 1948, two pedigree Beef Shorthorn bulls only have been used in the herd. These bulls were closely related so that, except for a small change in the cow herd due to a gradual grading up towards the pedigree beef animal, the calves used each year have been entirely comparable. This continuity has, however, now been disrupted by the purchase in 1953 of a pedigree Aberdeen-Angus bull for use on the Shorthorn cows, and this report is therefore the last in the series* dealing with Beef Shorthorn store cattle.

As in previous years, comparisons were made between outwintering and inwintering of bullock steers and between lots of housed heifer stirks receiving different rations. All feedingstuffs used in the trials were grown at Cockle Park. Analyses of the roughages fed were made at intervals of six weeks during the trial period. The mean results were:

	Dry Matter	Crude Fibre	Crude Protein	Digestible Crude Protein	Estimated Starch Equivalent
	per cent	*percentage of dry matter*			
Grass silage	17.8	31.0	18.6	12.9	45.6
Lucerne silage	19.7	32.1	21.9	14.8	44.0
Seeds hay	88.6	37.1	6.9	3.7	31.4
Lucerne hay	87.2	36.7	12.8	8.3	31.5
Swedes	11.2	—	1.2	1.0	64.0

(These figures are in close accord with those given by WOODMAN in *Rations for Livestock*, Ministry of Agriculture Bulletin No. 48, 12th edition, 1952.)

Though rather underheated, the grass silage was classified as being of the light brown, acid type. The material ensiled consisted predominantly of aftermath young leafy cocksfoot and ryegrass, with some clover present. Three separate analyses were made and, considering the variation that is normally found within a silage pit, the samples were fairly constant in their analyses. The low dry matter of the silage was not unexpected in view of the wet weather in late September when conservation took place.

Lucerne silage was made from young herbage cut at the pre-flowering stage and chopped before being ensiled. Because of the low carbohydrate content of the legume, molasses at the rate of 2 gallons per ton of green material, together with the same volume of water, were added in an attempt to encourage the correct fermentation. Despite this, the resultant material

* Reports of the Cockle Park trials have been published in the following issues of this JOURNAL:

November 1948, pp. 334-8.
January 1950, pp. 475-9.
January 1951, pp. 469-73.
December 1951, pp. 413-7.
December 1952, pp. 428-35.
June 1954, pp. 134-8.

was underheated and unpalatable, especially in the lower layers, where a tendency to over-consolidation resulted in the production of strong-smelling, slightly butyric silage.

The seeds hay, though of good colour and palatability, was rather fibrous and, on analysis, found to be of only moderate feeding value. Rye-grass, cocksfoot and meadow grasses formed the bulk of the conserved material, but some clover was present. Tripods were used in the making of lucerne hay, giving a green product of excellent palatability, though very stemmy owing to the advanced stage of growth at which the legume had been cut. With the exception of protein content, the two hays were of similar feeding value. The Caledonian swedes were reported as being of "good usual" quality.

The average daily rations consumed were as follows:

		Seeds Hay *lb.*	Roots *lb.*	Oats *lb.*	Beans *lb.*
Lot 1.	Ten bullocks, outwintered	11.8	—	1.5	1.5
Lot 2.	Ten bullocks, inwintered	12.1	10	1.5	1.5
Lot 3.	Ten heifers, inwintered	11.0	10	1.5	1.5

A preliminary period of fourteen days was allowed to accustom the stock to the experimental conditions. At the end of this time the animals in Lots 2 and 3 were consuming an average of 10 lb. hay per day, while the out-wintered bullocks were each taking 6 lb. hay. These quantities were increased as the trial progressed and, over the twenty-week period, the rations provided the following daily nutrient intake:

	Lot 1 (Outwintered) *lb.*	Lot 2 (Inwintered) *lb.*	Lot 3 (Inwintered) *lb.*
Dry matter	13.04	14.43	13.46
Digestible crude protein	0.81	0.83	0.79
Crude fibre	4.10	4.20	3.88
Starch equivalent	5.16	5.97	5.66

It must, however, be appreciated that the outwintered animals had access to pasture, so that the figures quoted for the Lot 1 animals in the above table do not represent their exact daily nutrient intake. It was not practicable, however, to measure the quantity and quality of the grazed herbage.

Outwintered versus Inwintered Liveweight gains made by the bullocks in Lots 1 and 2 are given in the table opposite. They show, as in previous seasons, that the inwintered cattle made the greater increase and were, on average, 119 lb. heavier than the outwintered bullocks at the end of the winter trial. When turned out to grass, the inwintered cattle did not gain as much as the outwintered animals, but their total gain over both the winter and summer periods exceeded that of the outwintered stock. This result was in agreement with those obtained in other years.

Average Increase in Weight of Cattle during the Feeding Trials, 1947-54

	Average for Six Seasons, 1947-53			Average for Seventh Year, 1953-54		
	Winter *lb.*	Summer *lb.*	Total *lb.*	Winter *lb.*	Summer *lb.*	Total *lb.*
Lot 1. Outwintered bullocks	87	185	272	52	210	262
Lot 2. Inwintered bullocks ...	165	146	311	169	184	353
Lot 3. Inwintered heifers ...	144	144	288	119	200	319

COMPARISON OF BULLOCKS WINTERED OUTSIDE AND WINTERED INSIDE, 1953-54

LOT 1 **10 Bullocks** **(Outwintered)**	Ear Mark	Initial Weight Dec. 3	Weight Gain or Loss Dec. 31	Weight Gain or Loss Jan. 28	Weight Gain or Loss Feb. 25	Weight Gain or Loss Mar. 25	Weight Gain or Loss April 22	Final Weight April 22	Average Weight Increase per Head	Average Summer Weight Gain per Head
RATION PER HEAD PER DAY		*cwt. qr. lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*cwt. qr. lb.*	*lb.*	*lb.*
lb.	17	5 0 0	2	−16	38	48	44	6 0 4		
Hay 11.8	11	5 0 18	14	−18	26	−10	14	5 1 16		
Oats 1.5	2	4 3 10	6	−26	34	− 4	0	4 3 20		
Beans 1.5	20	4 2 8	10	−16	22	10	2	4 3 8	51.8	210
	29	4 2 4	0	−14	6	22	6	4 2 24		
	33	4 0 12	10	−12	8	6	16	4 1 12		
	1	3 3 10	6	6	42	28	32	4 3 12		
	22	3 1 0	24	−12	26	− 6	16	3 2 20		
	38	2 3 20	12	4	20	− 8	12	3 1 4		
	30	4 0 0	4	− 2	34	28	24	4 3 4		
Mean		4 0 25	8.8	−10.6	25.6	11.4	16.6	4 2 21		
LOT 2 **10 Bullocks** **(Inwintered)**										
RATION PER HEAD PER DAY										
lb.	10	5 1 12	22	32	14	20	80	6 3 12		
Hay 12.1	21	4 2 20	36	22	32	26	44	6 0 12		
Roots 10	25	4 0 0	32	42	30	16	44	5 1 24		
Oats 1.5	32	3 3 4	22	40	26	42	50	5 1 16		
Beans 1.5	12	3 1 0	24	16	22	34	40	4 1 24		
	15	5 1 0	30	28	36	62	40	7 0 0	169.4	184
	26	4 2 2	18	30	46	58	34	6 0 20		
	6	4 3 0	24	22	50	64	28	6 1 20		
	27	3 1 6	24	24	14	58	46	4 3 4		
	37	3 2 2	20	6	32	62	30	4 3 12		
Mean		4 0 27	25.2	26.2	30.2	44.2	43.6	5 3 0		
Difference between Means of Lots 2 and 1		— — 2	16.4	36.8	4.6	32.8	27	1 0 7	117.6	−26

The below average liveweight increase made by the Lot 1 animals was felt to be related to the severity of the winter and to sparseness of keep on the pasture on which they wintered. It was subsequently reflected in the valuation conducted at the end of the feeding period when, for the first time in seven years, the inwintered beasts were valued at a higher figure than the outwintered animals.

The inwintered heifers gained an average of 119 lb. over the winter feeding period, compared with 169 lb. by the inwintered bullocks. This result was in keeping with their lower initial body weight and smaller hay consumption.

Trials with Hay and Silage A further twenty animals of similar age and breeding were used in two small-scale experiments, designed to compare the relative merits of lucerne hay and silage with hay and silage from the more traditional ley as fodder for young beef cattle. Two lots of five heifers were fed silage to appetite, while two similar lots of five bullocks received a ration of hay, 10 lb. swedes, 1½ lb. crushed oats and 1½ lb. crushed beans.

A crossover design using ten replicates was adopted for the trial. As there was considerable variation in weights at weaning, it was decided to pair the animals so that within pairs there was as little difference as possible between initial body weights. Such a procedure was deemed necessary, as it was felt that animals with varying live weights at the beginning of the feeding period would make associated weight increases. As a result of the pairing, the ten animals within each group were arranged in five 2 × 2 Latin squares. The ten animals comprising one group were housed under the same roof and, as far as possible, all aspects of management, other than the ration fed, were identical.

Lucerne Silage versus Grass Silage In the silage trial both lots of heifers were fed on grass silage for a preliminary six-week period. During the seventh week lucerne silage was gradually introduced into the diet of the Lot 4 heifers; until by the end of the week the legume had completely replaced grass silage. The Lot 5 heifers continued on the original ration.

These diets were maintained for a further six weeks, after which they were gradually reversed. Thus the twenty-week period was composed of a preliminary six weeks, two experimental terms of the same duration, and two single weeks when changes in the ration were made. Any liveweight gains or losses in the change-over weeks were ignored, but otherwise the animals were weighed at weekly intervals. Weighing started at 10.30 a.m. on each occasion.

The liveweight changes shown by the paired animals are given below:

Liveweight Gains and Losses in the Experimental Periods (lb.)

Ear Mark	CE14	CE18	CE4	CE16	CE8	CE34	CE7	CE13	KG3	KG2
Period 1 ...	28*a*	40*b*	14*a*	44*b*	20*a*	26*b*	22*a*	38*b*	42*a*	26*b*
Period 2 ...	42*b*	8*a*	36*b*	4*a*	30*b*	0*a*	32*b*	8*a*	20*b*	−4*a*

a = Animals on lucerne silage; *b* = Animals on grass silage

Mean Liveweight Gains (lb.)

Lucerne Silage	Grass Silage	Period 1	Period 2
14.2	33.4	30	17.6

A statistical examination of the above data revealed that only the difference between the two treatments was significant, the grass silage producing a greater liveweight gain than the lucerne. The difference between the mean liveweight increases for the two periods was not significant, being no greater than that which might occur by chance. This was a little surprising, since the rate of liveweight gain is usually closely related to body weight in animals of this age. It could only be concluded that the poor gains made by the heifers when fed on lucerne silage masked the normal behaviour.

A comparison of the chemical composition of the two silages revealed them to be reasonably similar in nutritive value and degree of conservation, but there proved to be considerable differences in palatability, especially towards the end of the trial, when the lower layers of lucerne silage were being fed. Consequently, while the average daily consumption of grass silage was 76 lb. in the first trial period and 85 lb. in the second, the figures for lucerne silage were only 53lb. and 47 lb. respectively.

The average daily quantities of nutrients supplied by these rations were:

	Period 1		Period 2	
	Lot 4 (Grass) *lb.*	Lot 5 (Lucerne) *lb.*	Lot 5 (Grass) *lb.*	Lot 4 (Lucerne) *lb.*
Fresh silage consumed	76	53	85	47
Dry matter	13.53	10.44	15.13	9.26
Digestible crude protein	1.75	1.55	1.95	1.37
Starch equivalent	6.17	4.59	6.90	4.07

It was concluded from this trial that, while lucerne silage was inferior to grass silage as a food for heifer stirks, this inferiority was attributable to a lower intake of the legume rather than to any major differences in the chemical composition of the two silages.

Lucerne Hay versus Seeds Hay Two lots of five bullock stirks were in turn fed lucerne hay or a six-week period in an experiment, the procedure of which was identical with that followed in the silage-feeding trial. Liveweight changes shown by the paired animals were as follows:

Liveweight Gains in the Experimental Periods (lb.)

Ear Mark	CE15	CE5	CE6	CE3	CE26	CE23	CE37	CE31	CE27	DL3
Period 1 ...	56*a*	14*b*	62*a*	66*b*	66*a*	44*b*	48*a*	26*b*	30*a*	54*b*
Period 2 ...	78*b*	68*a*	82*b*	96*a*	72*b*	80*a*	100*b*	58*a*	56*b*	76*a*

a = Animals on lucerne hay; *b* = Animals on meadow hay

Mean Liveweight Gains (lb.)

Lucerne Hay	Meadow Hay	Period 1	Period 2
64	59.2	46.6	76.6

A statistical analysis of the data from this experiment showed that the mean liveweight gain during the second experimental period was significantly greater than that during the first, irrespective of the ration fed. This was to be expected, since during the second period the animals were both older and heavier. As the difference in liveweight gains between the two treatments was not significantly different from that which might have occurred by chance had the two rations been the same, it was concluded

that lucerne hay was of similar value to seeds hay when fed to young beef stores.

Except for differences in protein content, the two hays were very similar in their chemical composition and, since the daily consumption of both was identical, it was not surprising to find no significant differences in the liveweight gains obtained by feeding the two hays together with the same quantity of roots and concentrates.

Conclusions Bullocks inwintered on a ration of hay, roots, oats and beans again made greater liveweight gains than similar stirks outwintered on hay, oats and beans and, exceptionally, were worth more than the outwintered beast at the valuation in April 1954. This order of liveweight gain was reversed in the summer, but taking the winter and summer periods together, total liveweight increase favoured the inwintered bullocks. Because of its low palatability, lucerne silage was found to be inferior to grass silage as a food for heifer stirks, but lucerne hay gave similar results to those for seeds hay when fed to young beef stores.

The writers wish to acknowledge the valuable assistance given by Mr. P. P. Brennan, B.Sc., Farm Manager, and K. Wright, Assistant Stockman, in the conduct of the trial.

THE MINISTRY'S PUBLICATIONS

Since the date of the list printed in the December 1954 issue of AGRICULTURE (p. 454), the undermentioned publications have been issued.

MAJOR PUBLICATIONS *Copies are obtainable at the prices quoted from the Sale Offices of H.M. Stationery Office or through any bookseller.*

Land at Herne Bay and Whitstable, Kent: A.L.C. Report (*New*) 2*s.* 0*d.* (2*s.* 1½*d.* by post)
Tractor Ploughing (*Revised October 1954*) 2*s.* 0*d.* (2*s.* 1½*d.* by post)

LEAFLETS *Up to six single copies of Advisory and Animal Health Leaflets may be obtained free on application to the Ministry (Publications), St. Andrew's Place, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from the Sale Offices of H.M. Stationery Office.*

Advisory Leaflets

No. 58 The Grey Squirrel (*Revised December 1954*)
No. 67 Lucerne (*Revised December 1954*)
No. 86 Glasshouse White Fly (*Revised December 1954*)
No. 258 Ropy Milk (*Revised October 1954*)
No. 339 Chrysanthemum Eelworm (*Revised July 1954*)
No. 354 Silage from Sugar Beet Tops (*Revised November 1954*)
No. 423 The Farrowing Crate (*New*)
No. 431 Feeding of Chicks and Growing Stock (*New*)

Animal Health Leaflets

No. 27 Swine Erysipelas (*Revised December 1954*)

Fixed Equipment of the Farm Leaflets

No. 27 The Fertilizer Store (*New*) 2*d.* (3½*d.* by post)

FREE ISSUES *Obtainable only from the Ministry (Publications), St. Andrew's Place, Regent's Park, London, N.W.1.*

Farm Machinery Leaflets

No. 19 Pick-up Balers (*New*)

THE MINISTRY'S PUBLICATIONS

Farming Topics

No. 9 Autumn Rearing of Calves (*New*)

Miscellaneous Leaflets

At a Glance—Check Card (*Revised November 1954*)
Farm Machinery—Prevention of Accidents (*Revised October 1954*)
Improvement Grants for Hill and Upland Farms (*New*)
Revolving Loan Fund for Agriculture: Conditional Aid (*New*)
Suggested Seeds Mixtures for Welsh Grassland (*Revised December 1954*)

Other Publications

Sectional List No. 1. Agricultural Publications (*Revised October 1954*)

FARMING AFFAIRS

Power Farming Conference at Harrogate The fifth National Power Conference, held at Harrogate on February 15-17, was probably the most informative of the series. The subjects for discussion had been well chosen, the papers were read by men of wide experience, and many of the several hundred farmers and representatives of agricultural engineering concerns present took an active part in the discussions.

Those who attended the Conference would find it difficult to pick out the highlights, but the following points are worthy of note. In a discussion on last year's difficult grain harvest, MR. R. HARTLEY, who farms on a big scale in the Fens, and has used both a continuous drier and a ventilated silo grain drying and storage plant, was firmly in favour of the latter for his particular conditions. In contrast, MR. I. BLENKINSOP, with a small farm in Yorkshire, preferred to stick to the binder method of harvesting.

"Crops at Lower Cost" was the title of a talk by MR. T. V. GREGORY, manager of a large estate in Hampshire, and he succeeded in convincing many in his audience of the value, on both big and small farms, of records of man and tractor hours, coupled with estimates of tractor and equipment running costs. For example, he found from his records that the efficiency of the labour engaged in silage-making by buckrake decreases progressively with increasing size of gang—one man and one buckrake being the ideal. This was an encouragement to mechanization on the small farm, and accords with the results obtained in similar studies elsewhere.

Use of the pick-up baler for silage-making aroused great interest, the subject being introduced by MR. A. O. ELMHURST, who farms near Barnsley, and has used this method with steadily increasing success since 1950. Little doubt was left of the possibility of making good silage by this method, and emphasis was placed on the saving of time at feeding. The large gang needed for efficient working when collecting the bales came in for some critical comment, and emphasis was placed on the vital importance of getting the bales well consolidated in the silo. The building of unconsolidated stacks of bales had been found to be unsuccessful.

MR. FRANK HENDERSON of Oxfordshire, while criticizing manufacturers in regard to such matters as their instruction books, also took the opportunity to remind his fellow-farmers of common shortcomings in care and maintenance of machinery.

During discussion of SIR THOMAS WEDDERSPOON's talk on equipment for potato growing, a plea was made for a regular series of potato harvester demonstrations, comparable with the national sugar beet harvester demonstrations which have done so much to assist development of the use of beet harvesters throughout Britain. It was suggested that the new Potato Marketing Board might provide a suitable medium for bringing together the various organizations that would be concerned in making such an effort successful.

BRIAN BRANSTON's paper on the application of time-and-motion studies to farm work brought from a Norfolk farmer who had profitably employed professional consultants the suggestion that the N.A.A.S. should have in each province one officer with some training in such work. There were also papers on subjects such as mechanical handling, and making the most of electricity. On the latter aspect, MR. S. F. STEWARD, chairman of an Area Electricity Board, said that about 250 farms were now being connected up every week, but that farmers in general were proving a little slow in making full use of the power that was made available.

C. Culpin.

Farming Cameo: 50. Hiraethog, Denbighshire

The Hiraethog district consists of a chain of fifteen parishes situated along the northern and western perimeter of Denbighshire. The northern border is formed by the coast, and in the west the River Conway marks the dividing line with Caernarvonshire, almost from its source to its outlet in the Irish Sea. This area is shaped something like a boomerang, with the town of Llanrwst at the elbow, Abergele at the coastal end, and Corwen at the inland extremity. The district probably derives its name from the fact that the two arms hug the central core of the Hiraethog Moors. As one would expect, the River Conway provides for most of the natural drainage of the district. However, the Corwen extremity drains into the River Dee, the northern, or coastal, area has numerous small rivers, and the uplands east of Llanrwst drain via the Elwy to the River Clwyd.

The only real lowland is found in parts of Llanelian, Bettws-yn-Rhos, and the upper Conway Valley between Bettws-y-Coed and Llanrwst. This is certainly the most fertile part of the district. Most of the area is hilly, and the character of the farming soon changes with increasing elevation to an upland type of mixed farming on the hills and slopes, which form a wide irregular belt between the lowland and hill farming proper, and account for most of the district. There is a general gradation within the belt from something akin to lowland farming on the lower levels to the poorer upper regions where, with increasing elevation, exposure and lower intrinsic fertility, the type approximates to hill farming proper. After leaving the Conway Valley inland from Llanrwst, hill farming predominates.

The soils of the district are derived from three main types of parent material; namely, Carboniferous Limestone, hard shales and grits, and soft shales and grits. Soils derived from Carboniferous Limestone are found in the Llandulas, Llysfaen, and Penmaen areas. The hard shales and grits are widespread throughout the district, but the soft shales and grits have given rise to rather heavier sedentary soils and are centred in the Llanelian and Bettws-yn-Rhos areas. Impeded drainage and peat formation have produced many local modifications, and there is a small area of river alluvium in the Conway Valley.

On the whole, farms in the area are small. Over 75 per cent of the 1,200 holdings are under 75 acres, being either family farms or employing one

workman, and some 45 per cent are smallholdings of under 30 acres, mostly worked on a part-time basis. Stock numbers show that the main enterprises are connected with cattle and sheep. Upland parishes have a bias towards rearing, whereas the lower regions are either balanced between milk production and rearing or tend towards milk production. During the ten years to 1950 milk production increased tremendously, and this high output is being maintained. In addition, there has been an expansion in rearing and fattening in the last few years. The Shorthorn breed is popular throughout the district, and the Friesian, Ayrshire, and other breeds are represented, but in the uplands and hills the Welsh Black cattle are well established. Sheep are mostly confined to the hill farms. The popular breed is the Welsh Mountain, which can thrive reasonably well in the summer on the 17,000 acres of communal rough grazing. There are some lowland flocks in which the Welsh sheep is crossed with Suffolk, Southdown, Wiltshire, or Border Leicester, as well as a few pure-bred flocks of some of these breeds. In the last few years pigs and poultry numbers have increased greatly, particularly on the general farm, and they now form reasonably important subsidiary enterprises. Horticulture, too, is represented, mainly in the parish of Glan Conway, and has a ready market for its produce in the North Wales seaside resorts.

A trend towards a reduction in arable crops is evident, but the change of emphasis is to a crop which is more suited to the heavy rainfall (which is in the 40-80 inches range over most of the area), and the grass break in the rotation is being lengthened. Reclamation of rough, poor land for the production of better grass proceeds apace. Despite the fall in the arable acreage, kale is an expanding crop, especially in the lowland parishes.

To sum up, the prosperity of the area is dependent upon milk production, rearing and hill sheep farming. Production has been appreciably increased by the adoption of new practices, and it is hoped that this advance will continue, for by blending good practice with better farm management much can be done for the betterment of both farmer and industry.

D. T. Evans,
District Advisory Officer

The Mechanic on the Farm: 11. Taking the Tools to the Job

When possible, an implement that has broken down in the field should be brought back to the workshop to be repaired, because the necessary work will be done quicker and better in the dry and the warm. Indeed, many jobs, such as the fitting of bearings, cannot be done successfully in a field where grit may blow into the parts which have been taken to pieces.

Sometimes, however, the broken-down implement cannot be moved, and anyway there are many repair and construction jobs on fixed equipment such as fences that have to be done on the spot. If the site is far from the workshop, much time can be wasted in fetching odd tools unless a complete outfit is collected together and taken out when the job is started. On such occasions some sort of ready-assembled pack of tools can be extremely convenient. It is wasteful, however, to put aside tools to be used for emergencies and nothing else. One solution is to house part of the ordinary tools of the workshop in a box with a good lid and handles, instead of on shelves or in drawers. Tools from this box can still be used in general work in the shop, but they must be put back into the box when they are finished with, so that the complete set is always ready to be taken out. Experience soon shows what tools can most usefully be chosen for this box.

There is another way of tackling these on-the-site jobs, and that is to take the whole workshop to the place where the work has to be done. When a small wooden workshop is being built for the farm, it can be constructed just as well on a two-wheeled, pneumatic-tyred trailer chassis as on the ground. The chassis must be strengthened with extra bearers, otherwise the framework of the shed flexes when the outfit is being towed, the windows break, and the sides and roof soon get loose. A low-loading type of chassis should be used, and if the land is rough the shed must always be towed slowly. There must be a jack at each corner of the chassis so that the weight can be taken off the tyres and the shop made rigid when it is parked in its own place at the farmyard. It can be wired for a mains electric supply, connected through a safe detachable cable to a point in the farm buildings, and, in addition, it can be fitted with auxiliary lighting by 12 volt lamp bulbs. When the shop is towed to a job by a tractor, it is an advantage if the tractor stays with it, since the lights in the shop can then be supplied by cable from the tractor battery.

H. J. Hine

A Timber Dutch Barn Modern farming requirements are causing us to look again at our existing farm buildings. Take barns as an example. Our modern steel-framed Dutch barn came into general use about the middle of the last century, but apart from the lighter steel sections with which it is now constructed, it has not altered much. The general trend of design in framed structures since the end of the war, however, has been towards the increased use of the "portal frame" or "rigid arch" type of construction, which provides for a free roof space unencumbered by roof trusses or tie beams. Such a space is a great advantage, for the barn can then be filled almost to ridge level without difficulty. Dutch barns on this rigid frame principle are now quite common in precast concrete, and to a less extent in steel.

The Timber Development Association have recently introduced a new method of rigid frame construction in timber, and this has been taken up commercially by a Midland firm. The new barn has a span of 30 feet, is divided longitudinally into five 15-foot bays and is 18 feet to the eaves (see Fig. 1).

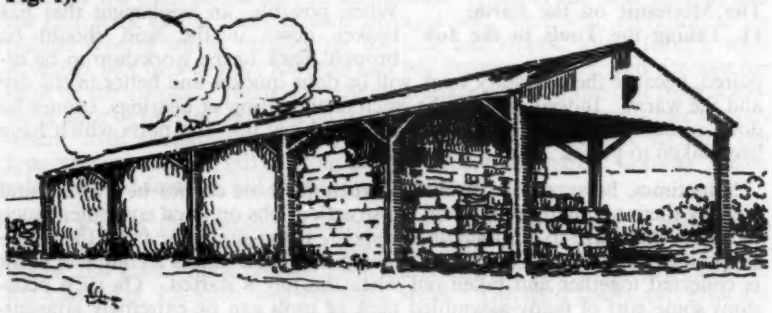


Fig. 1
A Timber Dutch Barn.

It will be seen that the outline of the frames forming the main structure is exceptionally clean in appearance and gives unrestricted height to the ridge. The uprights and the rafter members are each composed of two normal section timber scantlings—two 9 inches × 3 inches in the case of the columns,

and two 9 inches × 2 inches for the rafters—while the corners of the framework are "turned" by making use of steel plates sandwiched between the twin timber sections. So as to resist the sheer forces developed at these points, the timber steel junction is made by bolts and single-sided "bulldog" connectors, which, by biting into the timber face, spread the area of contact. This sandwiching of steel between two timber members is an interesting and ingenious adaptation of the old-style "flitched" beams, which were used extensively before the rolled steel joists superseded them.

A similar method is also used in the foundation to avoid embedding the timber in the ground. Here the steel plate is extended into the concrete foundation itself to give proper and adequate fixing. The barn, therefore, is a true "portal" or rigid frame, and it differs from an earlier timber barn in this respect. It has a pin instead of a rigid joint at the ridge and is, in fact, an arch.

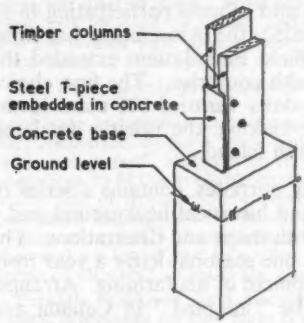


Fig. 2

Sketch showing method of fixing timber columns to concrete base above ground level.

Erection is easy and straightforward and can easily be carried out by farm labour. The sections, being in softwood, are relatively light to handle. Both the timber members and the steel plates are drilled in "jigs" before leaving the workshop, thus ensuring accuracy in fixing, while the timber is creosoted under pressure, thereby greatly reducing the cost of maintenance. The roof and gable apex are constructed of corrugated asbestos nailed to timber purlins and sheeting rails, with an access opening left in each gable apex. When the barn was tested with weights against all the calculated conditions of loading, including lateral thrust, it did not reveal a single defect or weakness, even when 50 per cent overloaded. The tests were made by the Timber Development Association.

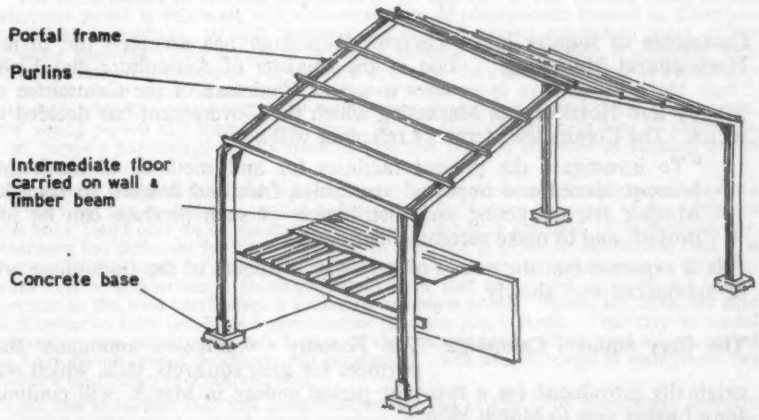


Fig. 3

Sketch showing how an intermediate floor can be added to a timber Dutch barn.

There are decided advantages in a barn of this type, which can be taken down, and re-erected on another site, especially if corrugated iron, instead of asbestos, sheets are used for the roof. An intermediate floor could also be readily inserted in the manner shown in the sketch below.

The cost works out at approximately £110 per bay, including gable apex filling, one line of sheeting rail, asbestos eaves gutter and down pipes, but excluding site works.

K. S. Lycett

Farming in School It is nearly three years ago that the Association of Agriculture introduced its Farm Adoption Scheme which today offers individual study of eight different kinds of farms in the United Kingdom and has over 1,100 colleges and schools participating in it. The success of this venture so manifestly sealed, the Association has now, with the financial encouragement of the Nuffield Foundation, extended the Scheme to embrace some of the Commonwealth countries. The first choice has been two farms in New Zealand—one a dairy farm of 126 acres in the North Island, specializing in milk for cheese-making, the other a fat lamb farm of 700 acres near Christchurch in the South Island.

Each folder, specially designed for teaching purposes, contains a series of papers describing the general topographical and historical background and a detailed account of the enterprise, together with maps and illustrations. The price of the folder is 10*s.* 6*d.*, which includes one seasonal letter a year from the farmer, recording the progress and development of his farming. Arrangements are also in hand for other farms to be "adopted" in Canada and Australia.

Now that the world is every child's oyster, there is no doubt of the important contribution which the Farm Adoption Scheme can make to bringing within his understanding something of the vital nature and the fundamental factors of food production; something of the risks, the planning, the indefatigable labour that brings him even one small bottle of milk every morning.

The address of the Association of Agriculture is 53 Victoria Street, London, S.W.1.

Committee of Inquiry into Horticultural Marketing Viscount Runciman has accepted the invitation of the Minister of Agriculture and Fisheries to act as Chairman of the Committee of Inquiry into Horticultural Marketing which the Government has decided to set up. The Committee's terms of reference will be:

> "To investigate the present facilities for and methods of marketing home-produced and imported vegetables, fruit and flowers; to consider whether the marketing and distribution of such produce can be improved; and to make recommendations".

It is expected that the names of the other members of the Committee will be announced very shortly.

The Grey Squirrel Campaign The Forestry Commission announces that payment for grey squirrels' tails, which was originally introduced for a two-year period ending in March, will continue for a further year to March 1956.

The scheme provides for the payment of a shilling a tail, and in the 18 months from its inception to September 1954 the number of grey squirrels

killed was more than double that of the previous corresponding period. In England alone, over half a million squirrels were destroyed.

BOOK REVIEWS

Making Mechanised Farming Pay. FRANK HENDERSON. Dairy Farmer. 21*s.*

In the prosperous times of the past fifteen years, we farmers have been able to buy equipment without too much thought about its efficiency, and to discard our new toys when we tired of them. Now our world is changing; the cold winds of competition blow and we must be keener and more careful in our purchases. Frank Henderson and his brother have always been that, and the experience which they have gained in thirty years of farming is put on record for the benefit of all.

The book, neither profound nor complicated, is full of hard, solid facts. The lucid pictures and sketches help to make the text crystal clear. Most implements and machinery in common use, together with their operations, are dissected and analysed. Mr. Henderson makes a very piquant inquiry in the question "Are all your crops really necessary?", and goes on to suggest that more farmers will have to arrange their operations to fit the available equipment. There is a lot in this idea, particularly in the wetter side of Britain, where many holdings will concentrate on grass and depend on purchased feedingstuffs to balance any deficiency. He gives useful hints on grass conservation, but I do not share his enthusiasm for pick-up balers—in my opinion, they make a lot of bad hay. For smaller farms, he supports tripoding—why not for farms of all sizes? That is the quality method.

Partially employed farm machinery is another expensive farm item, and often the capital investment for new plant is not justified by the amount of work it is likely to do. It is here that the secondhand market comes in. To keep our farm machinery flowing and up to date, there must be secondhand stuff; and while Mr. Henderson emphasizes the need for cautious buying, he explains how well-used implements and equipment may still fully meet the requirements of some farmers. He mentions also the farm workshop—"a place for everything, with everything in its place". But how many other holdings, I wonder, can boast one?

C.H.

Land is What We Make It. ERNEST MANNERS. Harrap. 12*s.* 6*d.*

The word picture of farming conditions in the first half of this century which Ernest Manners paints in this book will undoubtedly be of considerable interest to historians of British agriculture. It will, however, be of even greater interest to those of the younger generation who are about to start a farming career, because it is packed with sound advice and experience. It will also appeal to the older generation of farmers, as it carries them back to what are frequently referred to as "the good old days", although what the writer so clearly recalls were anything but good days. Here again, the young person can learn a great deal, for the account will help him to appreciate that farming has always had its troubles and that the real pleasure of farming lies in overcoming them!

A careful study of this book will repay any young person, although he will have to decide what can usefully be applied today and in the future, for some of the advice in the book could only be of assistance to someone living in the past. For instance, Mr. Manners has little use for farm accounts; in fact, one is given to understand that if it were not for income tax returns, he would advise a farmer not to keep any! Knowing your cost of production is an all-important basic fact today, and accounts are as important as the land itself when it comes to making a profit. Again, Mr. Manners says it is better to have too large a farm rather than too much stock. This may be sound advice up to a point, but can a farmer or the country really afford over a long period to have farmland not producing the maximum? The use of horses is mentioned, but not the economics of working them.

All this illustrates that you cannot expect to find in this book the answer to every question which can be asked about farming. Nevertheless, there is a wealth of interesting and profitable reading in it.

F.H.

British Poultry Standards. Poultry World. 25*s.*

Within the 348 pages of *British Poultry Standards* are included a glossary of terms, a list of sitting and non-sitting breeds, a chronicle of defects and deformities, a page on show preparation, a description of 66 breeds of fowls, 47 of bantams, 6 of turkeys, 15 of ducks, and 10 breeds of geese, and, finally, a guide to the important characteristic of eggs and table poultry. The book is well produced and profusely illustrated; indeed, the coloured plates showing feather markings are excellent. It is a pity that, no doubt because of the cost, the illustrations of the various breeds could not also have been in colour.

In the introduction to the book it is stated that there is nothing wrong with breed standards and, provided judges adhere strictly to them, especially when dealing with commercial breeds, two sets of standards can be avoided. It is difficult for the utility breeder to accept this, for while standards remain as they are, pullet and cockerel breeding pens will remain a *sine qua non* for the successful exhibition of many of the barred breeds. Is there any logical justification for recognizing a heterozygous blue as a breed standard—is it not a denial of the very definition of the term breed? Present standards undoubtedly have an aesthetic value, but many of them are not for the utility breeder.

One of the few privileges left to authors is that of dedication, and it would, perhaps, have been fitting to dedicate this book to, say, William Broomhead or William Rice. Also the date of publication, apart from an oblique reference to the Tenth World's Poultry Congress in the introduction, is not mentioned. This is a common and serious omission in books today, but in this case the lack of such information is more than ever regrettable, because it is stated that the Poultry Club will refuse to alter standards for a period of two years from the date of issue of the book.

In spite of its shortcomings, *British Poultry Standards* is a real improvement on its predecessor—the eighth edition of *The Poultry Club Standards*—and merits a place in the library of every poultry-keeper. It is an invaluable reference book for the fancy and will serve to recall to the utility-minded the days when the individual hen was regarded as more important than the flock. It will, too, be good for his soul in showing him something of the beauty which is attainable by diligent craftsmanship.

M.W.T.

Management in Farming. EDGAR THOMAS. Seale-Hayne Agricultural College. 4*s.*

The series of four lectures given by Professor Thomas at Seale-Hayne College during the 1953-54 session, under the Devon County Agricultural Association Lectureship, have been presented in book form. In his introductory remarks the author examines the principles and practices of good farm management. He suggests that while the principles are the same as those which apply to good management in other producing industries, there is a significant difference between the practice of management on the farm and in the factory.

The first three lectures deal in turn with each of the three broad groups of productive factors—land, capital and labour—which the farmer must manage with the utmost efficiency if he is to get the maximum profit from his business. Professor Thomas stresses the importance of a high level of output efficiently obtained from the limited amount of land, capital and labour at the farmer's disposal. Commenting on the increased scale of capital on farms today, Professor Thomas points out the need for farmers to use financial management practices of other industries, especially as regards the separation of personal and business finances and suitable provision for the maintenance and replacement of assets. The highest test of a farmer's efficiency must be his management of labour, because in agriculture, as in all other industries, output per man also determines the standard of living of every person engaged.

In the final lecture the various standards with which the farmer can measure his management efficiency are discussed. These standards do not themselves give the cause of any weakness, but they can be of great importance in indicating the particular sector of the farming system where this weakness lies.

Throughout the course of lectures, emphasis is laid on the importance of accurate records and the need for the preparation of both short-term and long-term plans, which must be adapted continually to changing conditions.

Professor Thomas is to be congratulated on the way in which he deals so clearly with his subject in such a short series. The lectures are admirably designed to introduce the student to the nature and complexity of farm management problems, and should prove very interesting to many practising farmers.

S.T.M.

Badgers' Year. F. HOWARD LANCUM. Crosby Lockwood. 6*s.* 6*d.*

Mr. Howard Lancum will be well known to many readers of this JOURNAL as the author of the Ministry's *Wild Animals and the Land* and *Wild Birds and the Land*. *Badgers' Year* is a charming book of 71 pages describing the author's experiences with a small badger community in West Devon. He introduces his narrative with some general remarks on the badger, and discusses its economic status. Although, in general, I agree with his findings, it should be emphasized that economic status varies so much with population density, nearness to habitation, competition for food, and so on, that exceptions are bound to occur, and what is true of one part of the country is not necessarily so for other areas.

In the course of the year Mr. Lancum carried out some interesting experiments on the food preferences of badgers by placing different samples where they were bound to be discovered, and noting what was eaten. In this way, he was able to discover some interesting new facts about the species of fungi taken. His description of the behaviour of a pair of badgers over the greater part of a year is full of both charm and humour, and Mr. Lancum is to be congratulated on his enthusiasm and endurance in keeping the community under observation on so many occasions during the year. Night vigils for long periods during the winter in places far from the beaten track can be extremely tiring, and at times most unpleasant; and from my personal experiences I can sympathize deeply with Mr. Lancum when ill-health limited his observations between February and April—a time when so much of interest in the life of the badger takes place. But in spite of this gap in the recording of the badgers' year, the reader will find much of interest, and the author's account of badger behaviour—both cubs and adults—is told with an understanding which only comes through prolonged personal study of the live animal.

The book is attractively produced and is illustrated by photographs taken by the author.

E.G.N.

The Plant Quarantine Problem. W. A. MCCUBBIN. Ejnar Munksgaard, Copenhagen. 34*s.* 6*d.*

The author, who has had thirty years' experience of plant regulatory work, explains the reasons why government control over the movement of plants is essential in order to hinder the spread of pests and diseases, and outlines the procedures adopted in the United States for regulating the import and interstate movement of plants. Examples are given of the damage caused when certain pests were unwittingly imported into U.S.A. with planting material; there is a chapter about the measures that have been taken to prevent the re-introduction of Potato Root eelworm and its further spread from Long Island; and a useful historical summary of certain domestic plant disease " quarantines " is included in an appendix.

The outlook is a purely national one, and the author looks forward to the time when it will be possible for the U.S.A. to obtain maximum security through embargoes made possible by self-sufficiency for all basic and secondary crops. Indeed he considers self-sufficiency is already attained or attainable for about 80 of the 105 crops which he lists. As pointed out, this is, of course, a personal viewpoint and must not be taken to reflect official opinion. There is nothing in the book to suggest that the author is aware of the F.A.O. International Plant Protection Convention of 1951 or of other recent achievements in promoting a spirit of international co-operation and goodwill in tackling the problems of plant legislation. America has played a prominent part in this work, and so Mr. McCubbin's forbidding forecast need not perhaps be taken too much to heart.

W.C.M.

Costs and Returns of Fattening Sheep on Roots in Devon (Department of Agricultural Economics, Bristol University, Report No. 80). E. T. DAVIES. 1*s.* 6*d.*

The austere title of this report does not do full justice to the valuable and interesting information which is presented. It is a study of the cost of fattening hoggs—that is, the winter fattening of store sheep born in the previous season—on 37 farms during 1952-53. The financial results do not reveal sheep fattening to be highly profitable, but this fact underlines a weakness of costing commodities without reference to the rest of the farm. For example, arable sheep perform a valuable function in treading and dunging light barley-growing soils and have earned for themselves the reputation of bearing the " golden hoof ". But it is difficult to assess such indirect benefit to the productive capacity of a farm, even with a full farm account; it is impossible to do so from a record of the cost of production of a single enterprise on the farm.

The study revealed a good deal of variation in production conditions, practices and results. The author has been aware of the limits of generalization from such diverse results, but he has been able to make some comparisons with the results of a similar study made in 1934. This comparison is an important feature of the report. Two striking changes appear to have taken place. First, there has been a dramatic reduction in labour from 44 man-hours per 100 hoggs per week in 1934 to 11 man-hours in 1952. This reflects, directly, the switch from hand-cutting and cleaning roots to folding on the roots, and, indirectly, the present relative cost of labour. Secondly, hand-fed concentrates have almost completely disappeared from the ration (64 lb. in 1934, compared with 5 lb. in 1952) and this change has been accompanied by some saving of labour, a slight increase in the fattening period and more intensive stocking.

If the report of the earlier study is consulted, it will be seen that market fluctuation in fat sheep prices was then an important factor. This factor was not important in 1952, when this present investigation was carried out, but it seems likely to grow in importance in the future.

J.A.

Artificial Illumination of Seedlings. John Innes Leaflet No. 11 (2nd Edition). Oliver and Boyd. *9d.*

This second edition is in effect a new leaflet, and brings up to date the information given in the earlier one. It summarizes experience from experimental work and commercial practice over the past two years, and surveys the three chief causes of failure to obtain increased cropping from the artificial lighting of tomato seedlings. The reader is then told simply and practically how to install and use high-pressure mercury vapour lamps for increasing the early yield of tomatoes and cucumbers. He is further warned of the importance of proper control of temperature—in particular, the avoidance of too high a temperature, which delays flowering, and of too low a temperature, which retards growth.

Artificial illumination of seedlings is no substitute for good growing, and it is the precision grower with conditions under his control who will benefit most from this addition to his technique for higher crop production. Every grower who has already tried this practice should see the new leaflet, whilst the newcomer to artificial illumination of seedlings would do well to study it before he starts.

R.T.P.

Printed in Great Britain under the authority of HER MAJESTY'S STATIONERY OFFICE by Billing and Sons Limited, Guildford and London.

(226) Pa.401808 21—72/1/3/55 B.&S. Ltd. Gp.307

but need he lose them?

Of every ten pigs born, he *expects* to lose two by weaning time—and another to die before marketing. Yes, these sobering figures are the average pig mortality for the country. No wonder more and more farmers are turning to AUREOMYCIN† for the remarkable benefits it brings in health and vigour to livestock. With better health comes less risk of infection—and, of course, lower mortality. Equally important are the faster growth rates and marked reductions in feed, time and labour costs that follow the use of Aureomycin. In short AUREOMYCIN means more profit per pig and:

- **MAXIMUM FEED EFFICIENCY**
- **HEALTHIER, MORE VIGOROUS STOCK**
- **EARLIER MATURITY**
- **SAVING IN FEED, TIME AND LABOUR COSTS**

Aureomycin is available in compound feeds; or, if you prefer to add the antibiotic to the feed yourself, simply order:

AUROFAC* 2A

AUREOMYCIN FEED SUPPLEMENT

*Regd. Trade Mark †Trade Mark

Obtainable from feed suppliers, corn merchants, chemists, etc.

Lederle

Animal Feed Department

LEDERLE LABORATORIES DIVISION

BUSH HOUSE - ALDWYCH - Cyanamid Products Ltd - LONDON, W.C.2 - TEMPLE BAR 5411

Please mention AGRICULTURE *when corresponding with Advertisers*